Home Run Hitters

Adventures with numbers

Home Run Hitters (1953)--Part 2 of 2

Why HOME RUN HITTERS makes your . . .

teaching MORE EFFECTIVE and

produces BETTER RESULTS in your arithmetic classroom

The teaching program in Home Run Hitters was tested and proven in actual school classrooms before publication. Both authors, Doctor Jesse Osborn and Adeline Riefling, are engaged in teaching children. They devoted fourteen years to the preparation and testing of every element present in this program. The features you get will make your own instruction more effective, easier to administer and more pleasant for everyone.

THE LEARNING PROGRAM — Presentation, practice, re-teaching, and review. There is a very definite, simple, psychologically sound pattern followed in presenting all material in Home Run Hitters.

		Example
1st	The antecedent process is reviewed	pp. 44-46
2nd	The new process is introduced	p. 47
3rd	It is followed immediately with practice involving the new skill	pp. 47-49
4th	The process is then re-taught	p. 77
5th	More practice follows	pp. 78-81
6th	It is maintained and reviewed from that time forward	pp. 96-102

In Home Run Hitters no process is ever introduced, then dropped, or taught but not practiced.

TESTING AND SPECIAL ASSISTANCE WORK — Every unit of work in Home Run Hitters closes with first, a diagnostic test (for example, page 109). Pupils revealing a need for remedial work in the diagnostic test will find this provided on the next page (page 110). For pupils of superior achievement there is a page of more difficult material (page 111). New processes are never introduced on this page. Then, for your final measure, an achievement test completes the unit (page 112).

PRACTICE — Home Run Hitters gives you 6049 separate practice problems.

MEANINGFUL ARITHMETIC CHILDREN UNDERSTAND — All skills and processes in Home Run Hitters are explained in terms meaningful to twelve year olds. This is possible because extensive classroom tests revealed clearly just what children at this level could understand and what they couldn't. Meanings too difficult for seventh grade youngsters have been excluded from Home Run Hitters.

A PROGRAM CHILDREN ENJOY — Home Run Hitters presents arithmetic that children really enjoy. Explanations as well as problem content are all based upon things that interest twelve year old children. The computational needs of seventh grade children form the material used in problem solving (glance over pages 61, 71, 113, 131).

In addition, interest-building devices used for years to add sparkle to basic readers brighten your arithmetic program for the first time. The baseball theme, which all seventh graders love, gives continuity and interest to your testing and special assistance pages. It gives this text its name. It is not used often enough, however, to lose its motivating force. Special games, races and group activities add life and sparkle to practice and daily work.

ARITHMETIC CHILDREN CAN READ — Too often learning in arithmetic is impeded by too difficult reading material. This problem has been eliminated in Home Run Hitters. All elements contributing to reading difficulty have been rigidly controlled. So successfully has this been done that Home Run Hitters measures only 5.7 when tested with the Lorge Readability Index Formula.

COLOR THAT HELPS YOU TEACH — Color is used in Home Run Hitters not only to make it the most attractive seventh grade arithmetic text, but more important, to help you teach. You find examples of new skills spotlighted in red, the important elements in a new process set out in color. As one child put it, "The red print tells me to stop, look, and listen."

TYPE THAT'S EASIER TO READ — Both Home Run Hitters and the famous Snellen Eye Chart are set in the same type. Its superiority has been proven by extensive laboratory tests. Dr. Matthew Luckiesh, famous vision expert, found, by test, that numbers used in Home Run Hitters are 50% more readable than those in the other arithmetics tested and the running words 20% more readable. This feature will greatly reduce eye strain and errors caused by faulty identification.

HOME RUN HITTERS • Grade 7

List price ~~$1.88~~ (Subject to usual school discount). Available also are teacher's manuals, answer books and workbooks.

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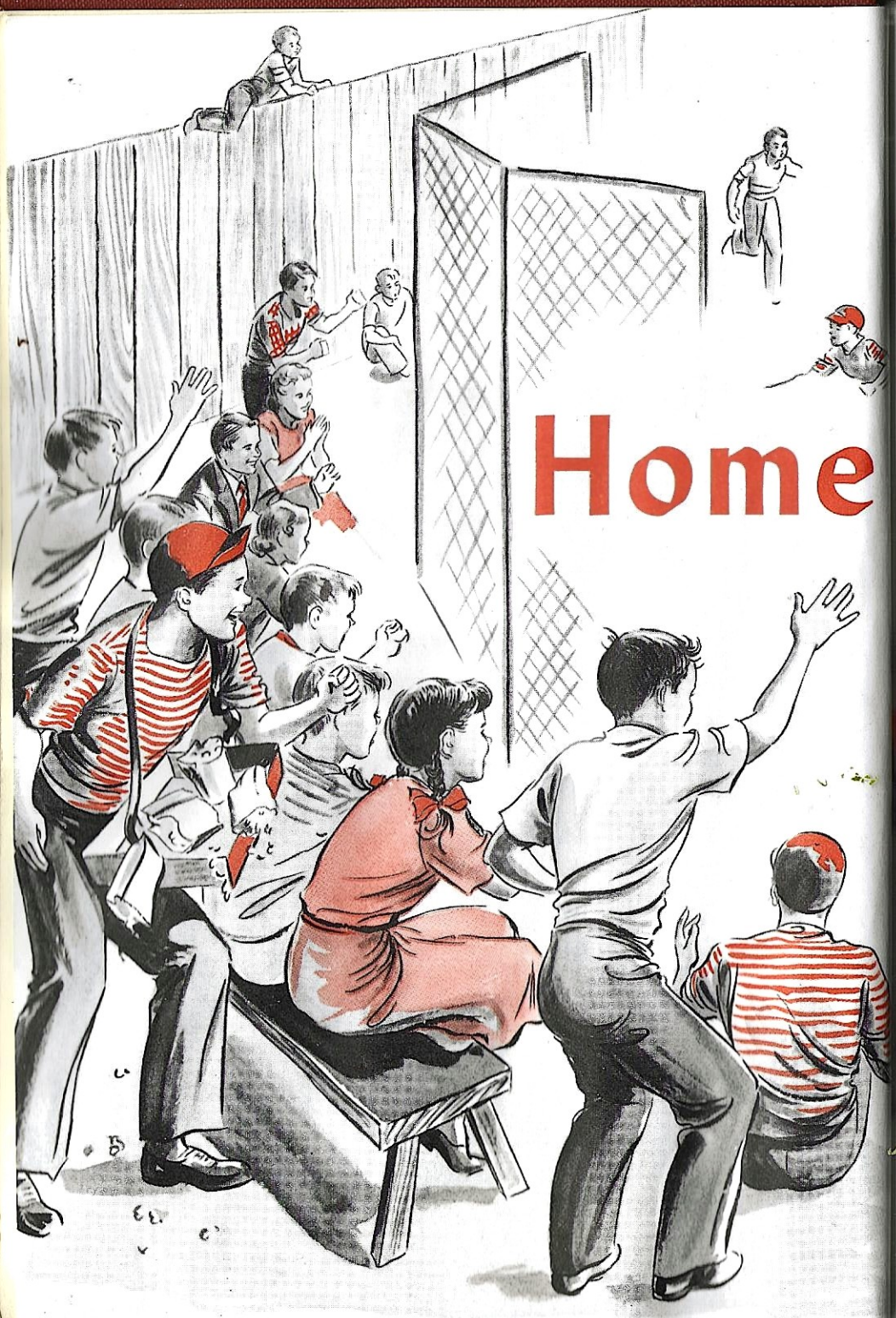
Home Run Hitters



Home Run Hitters

Adventures with numbers

JESSE OSBORN, Mathematics Consultant
Saint Louis Public Schools

ADELINE RIEFLING, Educational Counselor and
Reading Specialist, Saint Louis Public Schools

Illustrated by ROBERTA PAFLIN

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Webster Publishing Company

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Adventures with numbers

IN ORDER OF INCREASING DIFFICULTY

BUSY BEAVERS
RANGE RIDERS
STRAIGHT SHOOTERS
AIRPLANE ACES
HOME RUN HITTERS
CAGE CHAMPIONS

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★ Preface

Plan of Series. Adventures with Numbers is unique in organization. Each book has a motif taken from the pupils' world and captivating to the pupil. The motif furnishes the book's title. Young learners assume the role of Busy Beavers or Range Riders as they experience adventures with numbers. The boy or girl who is a little older plays that he is on the rifle range or piloting a plane as he gains further skill and understanding. The upper grade pupil takes part in a make-believe ball game, the rules and the scores of which provide motivation and sliding measures of achievement. Emphasis is placed on crediting the pupil with what he does correctly, without undermining his confidence when he fails to make a perfect total score, or the hypothetical 100%.

Unit Organization. Each book is divided into twelve units, each unit a little book in itself, with presentation of new material, practice in computation, and helps in problem solving. Pages of races, drills, and problems, with like captions and illustrations, occur in each unit of a book. The four closing pages of a unit are:

a. Test on material of unit, with a goal.
b. Helps for those who failed to reach goal a.
c. Challenges for those who did reach goal a.
d. Final unit test, geared to average pupil.

The first and seventh units of each book are given largely to reviewing and reteaching. Thus, twice a year, there are systematic campaigns to strengthen foundations so that the pupil can go into new work with new confidence, even though there have been gaps in his earlier work.

Non-Discriminating Differentials. Careful provisions are made for pupils with different learning rates. This is done in such a way as not to foster a superior attitude on the part of the fast learner nor to embarrass the one who learns slowly. Among the beavers, one who mends the wall can take as much pride in his work as the one who builds it higher. In basketball, one who recovers the ball is as valuable to the team as one who passes the ball. There is no higher nor lower with the pupil who does his best with the work that is appropriate for him. In Adventures with Numbers, there is differentiation without discrimination.

Individualized Program. Directions are addressed to pupils. Pupils are asked to choose partners, or to divide into groups or teams to do specific tasks.

They mark each other's papers and go on to the next task. This builds up a feeling of responsibility on the part of the pupil, and helps to release the teacher from constant direction of the class so that she can give help where it is most needed. The range between the slow learner and the fast learner in the average class is great. This series provides material and a plan so that the teacher can guide each pupil along at his own rate, rather than merely "covering" the material judged appropriate for the average pupil.

Readiness. Experience and experiments show that pupils do not become ready of themselves. We also know that teaching is wasted when the pupil is not ready. A program of preparing the pupil for each next step is skillfully woven into Adventures with Numbers. The «times-and» facts precede carrying in multiplication; station numbers precede uneven division. A boy's bicycle repair shop grows into a partnership and into a small corporation before stocks and bonds are presented. No process or idea is introduced until the pupil has been conditioned for it.

Presentation of New Concepts. Meanings, skills, and processes that are most difficult for the child to grasp are usually the ones that are most difficult to present clearly in a text. An author is tempted to be satisfied with something that he knows is inadequate, and to hope that teacher and pupil can fill in what is lacking. In Adventures with Numbers, no effort has been spared to present each new idea clearly and adequately. A pupil is not stopped today by the height of the ultimate goal in arithmetic, but by some little point in today's lesson that is not clear to him. Our presentations make the steps short and leave no gaps.

Using Arithmetic. A pupil may excel in book computation or book problems, and fail to see that the purpose of what he learns in school is to help him outside of school. He fails to carry what he learns in the little world within the school to the big world on the outside. Adventures with Numbers guides the pupil to the use of arithmetic in his everyday affairs, and helps him see arithmetic as a part of his whole self and not just a part of his school self.

Importance of Arithmetic. Quantitative thinking plays a more decisive role in our age than ever before. This is an age of number, measurement, science, and technology. The pupil who leaves school deficient in arithmetic is blocked from entering many fields. He will be handicapped in his efforts to earn a good living, or to buy most with what he does earn. For the individual who will carry his load and for the nation, arithmetic is truly an important part of the education for survival.

★★★★★★★ Contents

Unit VII. Pages 169–196

Work time and wages. Thrift. Installment buying. Consumer borrowing. Saving. Developing problem solving.

Unit VIII. Pages 197–222

The common forms and tools of geometry. Drawing and measuring figures and designs. Developing problem solving.

Unit IX. Pages 223–248

Learning and using the common units of measure. Metric system. Developing problem solving.

Unit X. Pages 249–274

Measurement of square, rectangle, triangle, and circle. Use of formulas in finding perimeters and areas. Finding π. Volume of rectangular solids. Development of problem solving.

Unit XI. Pages 275–298

Public utilities: gas, electricity, water, telephone, transportation. Development of problem solving.

Unit XII. Pages 299–322

An extended and integrated activity project in which the arithmetic learned during the year is used in making a run-down amusement park show a profit.

Tables of Weights and Measures. Pages 323-324
Extra Practice. Pages 325—340

Continues from Part 1
of this book

Unit Seven

Figuring Wages

1. Mrs. Hall runs a sewing machine in a garment factory. She is paid $.75 for sewing the trim on a dozen dresses. In one week she sewed the trim on 60 doz. dresses. How much did she earn?

2. A new worker can sew the trim on only about 35 doz. dresses in a week. How much can a new worker earn per week?

3. Mr. Bates is a butcher. He works 40 hr. a week and earns $99.60. How much is this per hour?

4. Mrs. Sims is a saleslady. She is paid $30 a week, plus a commission of $\frac{1}{10}$ of all sales above $120. She sold $640 worth of goods one week. How much did she earn?

Punching a Time Clock

Each employee has a time card. When he holds the card in the slot and punches the clock, the clock stamps the time of arrival or leaving on the card. At the end of the week, the time card shows the exact time of arrival and leaving for each day. The weekly pay roll is made from the entries on the time card.

How many hours did Mr. Miller work each day? How many hours did he work in all? How much did he earn in the week?

Week Ending May 8 1948

Name D. A. Miller No. 45

	Starting Time In	Lunch Out	Lunch In	Quitting Time Out	Total Hours	Rate per Hour
M	8:00	12:00	1:00	5:00		$.88
T	8:30	11:30	1:00	4:30		$.88
W	8:00	12:00	1:15	4:30		$.88
Th	9:00	12:30	1:30	4:30		$.88
F	8:00	12:00	1:00	5:30		$.88

Total Time_____ Checked by

Pay Roll Entry $_____

Time Clocks Without Cards

Some time clocks do not record time on individual cards. Instead, there is a long strip of paper on which is recorded the time *in* and *out* of all the employees. At the end of the day, this strip of paper, or tape, is taken from the clock, and the number of hours each employee worked is copied on the payroll.

1. Find the wages of each of these employees:

No.	Name	M.	T.	W.	Th.	F.	Hr.	Rate	Wages
24	L. B. Noll	$7\frac{1}{2}$	8	8	$6\frac{1}{2}$	$7\frac{1}{4}$	$37\frac{1}{4}$	$.90	$33.52
27	J. K. See	8	8	$7\frac{3}{4}$	7	8	?	$.90	?
56	F. R. Lane	$5\frac{1}{2}$	$6\frac{1}{4}$	$7\frac{1}{2}$	8	$5\frac{1}{2}$	?	$.80	?
64	G. E. Barr	$6\frac{1}{4}$	$5\frac{3}{4}$	8	$7\frac{1}{2}$	5	?	$.80	?
79	W. A. Penn	8	7	$4\frac{1}{4}$	$5\frac{3}{4}$	8	?	$.87	?

2. Mr. Brown works 35 hr. a week regularly. If he works more, he is paid time and a half for overtime. One week he worked 42 hr. The rate was $1.10 an hour. How much did he earn?

When you work, you must be able to figure your wages to be sure the clerk who made the payroll did not make a mistake. This means you must be able to add, subtract, multiply, and divide well. Practice the next two pages until you can find each answer quickly and correctly.

Get Ready for the Races

Choose a partner, work as rapidly as you can. Check after each race. The first finished wins only if he has more right answers.

Race One. Write the sums.

1.

3	36	87	328	$4.25	6.318
8	47	9	46	6.17	.672
7	92	16	133	9.83	.046
4	18	24	98	.98	.009
9	17	8	492	.94	7.030
2	28	32	7	.17	.927
5	33	5	118	10.22	4.066

2. .04, 3.16, 1.00, 9.35, 8.60, .91

Race Two. Write the remainders.

3.

4,018	8,043	$16.29	1.31	20.20
2,935	3,049	9.37	.83	16.85

4. 103,602—80,005 5. 18.35 from 31.00

Race Three. Copy and multiply.

6.

54	973	8466	$15.19	$438.36
36	48	93	6	24

7.

1.36	93.4	26.2	43.86	75.01
5	35	8.3	6.89	.34

Race Four. Copy and divide.

8. $9\overline{)2718}$ $38\overline{)19192}$ $1.7\overline{)15.81}$ $.58\overline{)226.2}$

Fraction and Mixed Number Review

Stand immediately when you finish a race. Try to be among the first half of those finishing. Check. Try to have perfect scores in more than half the races.

Race One. Copy and add.

1.

$\frac{1}{8}$	$\frac{1}{2}$	$\frac{1}{6}$	$\frac{7}{8}$	$3\frac{1}{4}$	$2\frac{3}{4}$	$2\frac{3}{5}$	$6\frac{7}{8}$
$\frac{3}{8}$	$\frac{1}{4}$	$\frac{2}{3}$	$\frac{3}{4}$	$8\frac{1}{3}$	$6\frac{2}{3}$	$1\frac{1}{2}$	$3\frac{1}{3}$

2. $\frac{1}{4}+\frac{1}{2}+\frac{3}{8}+\frac{7}{16}$ $1\frac{1}{2}+2\frac{1}{4}+1\frac{2}{3}+3\frac{5}{6}$
3. $\frac{1}{3}+\frac{1}{2}+\frac{5}{6}+\frac{2}{3}$ $3\frac{1}{3}+2\frac{4}{5}+2\frac{1}{2}+4$
4. $\frac{2}{3}+\frac{3}{4}+\frac{1}{6}+\frac{5}{8}$ $5+6\frac{2}{3}+7\frac{1}{2}+3\frac{3}{4}$
5. $\frac{3}{5}+\frac{2}{3}+\frac{1}{2}+\frac{1}{4}$ $8\frac{1}{3}+5\frac{1}{6}+3\frac{1}{2}+6\frac{1}{4}$

Race Two. Copy and subtract.

6.

$\frac{7}{8}$	$\frac{2}{3}$	$\frac{4}{5}$	$\frac{5}{6}$	$5\frac{5}{6}$	$7\frac{1}{2}$	$8\frac{1}{3}$	$7\frac{1}{2}$
$\frac{1}{8}$	$\frac{1}{2}$	$\frac{1}{6}$	$\frac{3}{4}$	$1\frac{1}{6}$	$3\frac{3}{4}$	$2\frac{5}{6}$	$6\frac{2}{3}$

7. $\frac{7}{8}-\frac{1}{3}$ $1\frac{4}{5}-\frac{1}{2}$ $7\frac{1}{2}-2$
8. $\frac{3}{4}-\frac{1}{6}$ $4-1\frac{2}{3}$ $8\frac{1}{3}-6\frac{3}{4}$

Race Three. Copy and multiply.

9. $\frac{2}{3}\times\frac{1}{4}$ $\frac{5}{8}\times\frac{4}{5}$ $\frac{3}{16}\times\frac{2}{3}$
10. $1\frac{2}{3}\times3$ $5\times3\frac{4}{5}$ $6\frac{2}{3}\times1\frac{1}{2}$
11. $3\frac{3}{4}\times2\frac{1}{2}$ $1\frac{3}{5}\times4\frac{1}{2}$ $12\frac{1}{2}\times5\frac{1}{3}$
12. $4\times112\frac{1}{2}$ $237\frac{1}{2}\times2$ $2\frac{1}{2}\times496$

Race Four. Copy and divide.

13. $\frac{3}{4}\div\frac{3}{8}$ $3\frac{3}{4}\div2\frac{1}{2}$ $8\div2\frac{2}{3}$
14. $8\frac{1}{3}\div5$ $\frac{5}{6}\div\frac{1}{2}$ $\frac{5}{6}\div\frac{2}{3}$
15. $33\frac{1}{3}\div4$ $17\frac{1}{2}\div1\frac{3}{4}$ $26\div1\frac{5}{8}$

Thrift in Spending Wages Earned

It is always important to spend your earnings to the best advantage. Money can be made to reach a long way, and families can have many more of the good things in life if each member of the family makes a habit of careful spending.

1. Grocers have week-end and seasonal sales at which they sell excellent brands of goods at reduced prices. Bring an advertisement of a grocery sale to school and call the attention of the class to some worthwhile savings.

2. Month-end and seasonal sales of clothing stores, furniture companies, and department stores offer fine goods at reduced prices. Bring advertisements to school to show the class how a large amount could be saved by buying at such sales.

3. If the family wants a new car, an electric refrigerator, or a radio, is it necessary to wait until the money for the full cost of the article has been saved? Explain to the class what is meant by buying on the installment plan.

4. When an emergency arises, or when extra money is needed, how can it be obtained? A knowledge of the practices of loan companies may prevent your paying high rates of interest.

To use thrift in spending it is necessary to know quality and bargains. It is certainly worthwhile to know the methods used in business and to be wise enough to follow them.

Seasonal Sales

Most stores take inventory once or twice a year. In order to clear out old stock and make room for new goods, they have sales. By selecting carefully, you may buy goods of excellent quality at reduced prices at these sales.

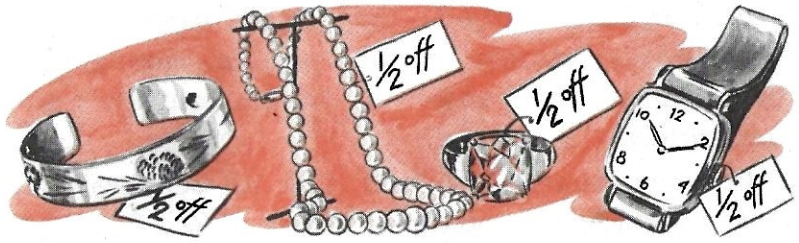
1. The Emerson Clothing Company had a semi-annual sale in July. They sold only the best quality goods, and were known to be honest in all their dealings. John bought a school suit that was marked to sell for \$48 at a discount of 20%. How much did he save?

2. Jane bought a sweater marked \$7.50 at a discount of $33\frac{1}{3}\%$. How much did she have to pay for the sweater?

3. Bill saved 50¢ by purchasing a pair of gloves at 25% off the marked price. What was the marked price?

4. The Quality Jewelers were selling many items at $\frac{1}{2}$ off the marked price. What was the cost of a watch that was marked \$37.50?

5. Ann paid \$15 for a ring. If this was $\frac{1}{2}$ off the marked price, what was the marked price?



Buying in Larger Quantities

Have you seen articles advertised at "5¢ each, or 3 for 10¢"? In buying at the latter price, you can save $\frac{1}{3}$ of the price, or $33\frac{1}{3}\%$.

1. Which is the better price, 2 lb. for 29¢, or 4 lb. for 50¢?

2. Mrs. Baker found that she needed 4 cakes of toilet soap each week. The regular price of the soap was 10¢ a bar, but a dozen could be bought for $1.00. How much did Mrs. Baker save by buying twelve weeks' supply at one time?

3. Canned asparagus marked 33¢ a can is sold at $3.50 a dozen. What is saved by buying this by the dozen?

4. At an automobile service station Mr. Jones pays 35¢ a quart for motor oil. He can buy it in gallon cans at $1.10 a gallon. What per cent would he save if he bought oil by the gallon?

5. A dealer had towels marked to sell at 79¢ each, or $9.00 a dozen. What is the amount of saving on two dozen towels?

Wise shoppers always check to see that they have been charged the right amount and receive the correct change. This means that they must be able to figure quickly and accurately.

Practice pages 177 and 178 to be sure you can work your shopping problems.

Can You Hit a Homer?

Mark papers at the end of each section. If you make mistakes in any section, study the pages given after the section number.

Section I. First Base (Page 45)

The answers in the first row are given. Fill in the others.

1.	$\frac{1}{2}=.5$	$\frac{1}{4}=.25$	$\frac{1}{3}=.33\frac{1}{3}$	$\frac{3}{8}=.37\frac{1}{2}$
2.	$\frac{3}{4}=?$	$\frac{1}{8}=?$	$\frac{1}{5}=?$	$\frac{4}{5}=?$
3.	$\frac{5}{8}=?$	$\frac{2}{3}=?$	$\frac{3}{10}=?$	$\frac{1}{6}=?$
4.	$\frac{5}{6}=?$	$\frac{3}{5}=?$	$\frac{7}{8}=?$	$\frac{2}{5}=?$

Section II. Second Base (Pages 48, 49)

5. Write the common fractions above as per cents.

Section III. Third Base (Pages 48, 49)

Write each of these per cents as a decimal.

6. 20% 10% 25% 4% 90% 1%

7. $8\frac{1}{3}\%$ $37\frac{1}{2}\%$ $33\frac{1}{3}\%$ $12\frac{1}{2}\%$ $6\frac{1}{4}\%$ $83\frac{1}{3}\%$

Section IV. Home Run (Pages 96, 97)

Supply the missing numbers as shown at the tops of the columns. There are 12 answers.

8.	$\frac{1}{2}\%=.005=\frac{1}{200}$		**12.**	$\frac{7}{400}=.01\frac{3}{4}=1\frac{3}{4}\%$	
9.	$\frac{3}{4}\%=?$	$=?$	**13.**	$\frac{2}{25}=?$	$=?$
10.	$100\%=?$	$=?$	**14.**	$\frac{3}{80}=?$	$=?$
11.	$225\%=?$	$=?$	**15.**	$\frac{3}{500}=?$	$=?$

Racing with Per Cents

Stand when you finish a row. Were you among the first to finish? Did you get every answer right? Help pages are indicated in parentheses.

Race One (Pages 50, 51)

Find the per cent in a box of each number in that row. The first answer is 2.

1.	1%	200	600	2000	60	3600
2.	5%	40	300	4000	20	7840
3.	$6\frac{1}{4}\%$	32	320	3200	80	4832
4.	$8\frac{1}{3}\%$	240	540	7500	96	2988
5.	$\frac{1}{2}\%$	400	360	4000	40	8200
6.	125%	240	400	3600	72	5824

Race Two (Pages 75, 76, 77)

The number in a box is what per cent of each number in that row? The first answer is 50%.

7.	2	4	8	50	12	200
8.	3	24	180	30	15	150
9.	5	5	75	80	50	500
10.	16	8	96	40	4	400

Race Three (Pages 78, 79)

The number in the box is the given per cent of the number you are to find. Begin, 24 is 50% of what number? The answer is 48.

11.	24	50%	25%	10%	5%	1%
12.	12	$6\frac{1}{4}\%$	$16\frac{2}{3}\%$	$33\frac{1}{3}\%$	$12\frac{1}{2}\%$	$8\frac{1}{3}\%$
13.	15	20%	100%	125%	150%	500%
14.	240	$\frac{1}{2}\%$	$\frac{3}{4}\%$	$1\frac{1}{2}\%$	.1%	.5%

Choosing Bargains

1. One store sells plain crackers at 2 pounds for 45¢. Another store sells the same quality crackers at 3 pounds for 55¢. Mrs. Hill needs 6 lb. of plain crackers. How much can she save by purchasing at the second store?

2. Different stores have the same grade of tomato juice at these prices:

1 pt. 8 oz. in a can at 3 cans for 55¢
50 oz. at 28¢ a can
1 qt. 1 pt. 2 oz., at 29¢ a can
10 oz. in a can at 6 cans for 50¢
1 pt. 4 oz. in a can at 3 cans for 50¢

Which of the stores offers the best bargain? There are 16 oz. in a pint.

3. Grapefruit juice was on sale:

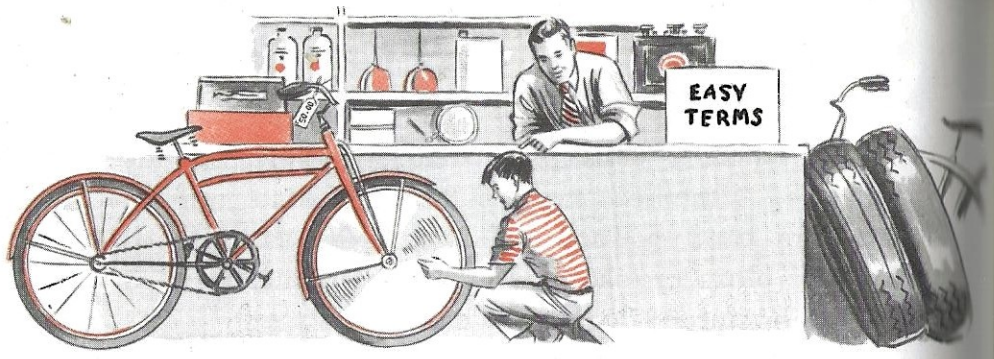
1 pt. 2 oz. in a can at 3 cans for 45¢
1 qt. 15 oz. at 39¢ a can

Which is the cheaper price per ounce?

4. The same quality coffee was for sale at 88¢ a pound or 3 lb. for $2.50. How much can one save per pound by purchasing 3 lb. at a time?

5. Hot Lump coal costs $18.75 a ton in August. The price is 8% more in September. How much can one save by purchasing 8 tons of coal in August rather than in September?

6. Earl's mother bought a chair at 15% discount. The marked price was $32. How much did Earl's mother have to pay?



Installment Buying

Many who wish to buy do not have the money to pay for what they want. Rather than lose sales, some merchants will allow the customer to take the goods he wants, and to pay for them later on the installment plan. Naturally, merchants must charge more for installment purchases to take care of the expense of collecting payments and to cover the losses they may have.

1. Bill wanted a bicycle that cost $50.00. He had only $35.70. The merchant agreed to let Bill have the bicycle for $35.50 cash and $2 a week for 12 weeks. How much did Bill have to pay for the bicycle? How much was this above the cash price? This extra cost is called the "carrying charge." What per cent was the carrying charge of the cash price?

2. The cash price of a tire was $15. The installment price was $1.50 cash and $3 a month for 5 months. What was the carrying charge? What per cent of the cash price was the carrying charge?

3. The regular price of a radio was $120. The sale price was 15% less than the regular price, and the installment price was 8% more than the regular price. What is the difference in dollars between the sale and installment price?

4. Mr. Lee bought a sedan for $1920. He paid $33\frac{1}{3}\%$ in cash and agreed to pay the remainder in 12 equal monthly installments. The carrying charge was $76.80. If the carrying charge was divided equally among the monthly payments, what is the total he paid each month? What per cent was the carrying charge of the amount he owed when he first bought the car?

5. A refrigerator can be bought for $250 cash, or for $40 cash and $20 a month for 12 months. What is the carrying charge? What per cent is the carrying charge of the cash price?

6. The cash price of a used typewriter was $49. The installment price was $8 cash and $8 a month for 6 months. What was the carrying charge?

7. The regular price of an encyclopedia was $56. As a special offer, the company sold the encyclopedia for $20 cash and $5 a month for 10 months. The installment price was what per cent of the regular price?

8. A radio could be bought for $20.85 cash, or for $10 cash and $2 a week for 8 weeks. What was the difference between the cash price and the installment price?

Loan Companies

It is the business of loan companies to lend, usually in small amounts to be repaid in weekly or monthly installments. The cost of lending small amounts and accepting repayments in installments is high. This makes it necessary for loan companies to charge higher rates of interest than businessmen need to pay.

1. Mrs. Jones was seriously ill for several months. The cost of doctors, hospital, and nurses was more than Mr. Jones could pay. He borrowed $200 from a finance company at $2\frac{1}{2}\%$ monthly interest, and agreed to repay the money borrowed in 10 equal monthly payments.

The first month, he had the use of $200. The interest was $.02\frac{1}{2} \times \$200 = \$5$. At the end of the first month, Mr. Jones repaid $20 of the principal plus $5 in interest.

The second month, he had the use of $180. The interest was $.02\frac{1}{2} \times \$180 = \$4.50$. At the end of the second month, Mr. Jones repaid $20 of the principal plus $4.50 in interest.

Find how much Mr. Jones paid each month until the loan was completely paid. How much interest did he pay in all?

2. Mr. Hall borrowed $300 from an Indus Bank, and agreed to repay $25 a month fo months. The bank charged 8% yearly int plus a commission of 2%. Both interest and c mission were payable in advance.

How much was the interest on $300 for a y How much was the commission?

Actually, Mr. Hall received only $270 f the bank, yet had to pay the bank $300. Be to explain.

3. Mr. Smith borrowed $150 from a fina company at $2\frac{1}{2}\%$ monthly interest. He agree pay the loan in 6 equal monthly payments, gether with whatever interest might be due.

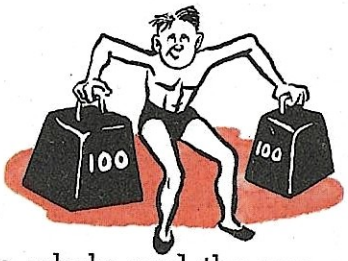
Make a table showing how much principal how much interest Mr. Smith paid each month.

4. Miss Dale borrowed $150 from an Indus Bank. The interest was 8% annually and commission was 2%, both payable in adva Miss Dale agreed to repay the loan in 12 e monthly payments.

How much money would Miss Dale actually ceive from the bank? How much would she h to repay each month? How much would she the bank in all?

5. Miss Lee borrowed $120 from a fina company. She repaid principal and interest six equal monthly payments of $21.75. W was the total interest?

Developing Power in Problem Solving



No pencils, please!

1. If you are given the whole and the per cent, or rate, how do you find a part of the whole?

2. If Mr. Jones has $300 in the bank, what is his interest for one year at 2%?

3. If Mrs. Smith puts $400 in the bank and receives $1\frac{1}{2}\%$ interest for each full 6 months that the money is there, what is her interest for the first 6 months?

4. If you know the part and the whole, how do you find what per cent the part is of the whole number?

5. Tom had $15. He spent $3 for a bicycle light. What per cent of his money did he spend?

6. Ann had 40 problems to work, but was not able to get 5 of them. What per cent of her lesson did she fail to get?

7. If you know the part, and what per cent the part is of the whole, how do you find the whole?

8. Mary earned $.50 taking care of Tom's little brother. If this was $66\frac{2}{3}\%$ of what she earned yesterday, how much did she earn yesterday?

9. Jack got $.80 interest on his bank account. If this was 4% of what he had in the bank, how much was his account?

10. Billy sold his bicycle for $16. If this was 50% of what the bicycle cost when it was new, what did the bicycle cost when he got it?

11. Learn these formulas and they will help you with your percentage problems.

Whole × Rate = Part	($12 × .03 = $.36)
Part ÷ Rate = Whole	($.36 ÷ .03 = $12)
Part ÷ Whole = Rate	($.36 ÷ $12 = .03)

12. Mr. Smith invested $14,000 in a house. He sold it at a loss of 5%. What did he lose?

13. Jane wants to make 15 glasses of jelly. She has finished 9 glasses. What per cent has she finished?

14. Jerry played 20 tennis matches and lost 8. What per cent of the matches did he lose?

15. Tom won 16 games of checkers. This was 80% of the total number of games played. How many games did he play?

16. Mrs. Brown saved $18 last month. If this was 6% of all the money her husband earned that month, what were his total earnings?

17. Mrs. Thomas paid $24 down on a new refrigerator. If this was 12% of the cost, what did she pay for the refrigerator?

18. The carrying charge on a bill of furniture was $2.50. If this was on $500 worth of furniture, what was the rate of the carrying charge?

19. Ted had 72 rabbits and sold $16\frac{2}{3}\%$ of them. How many rabbits did he have left?

Special Practice

Get a partner to work with you. Mark papers for each other at the end of each line. Ask the teacher to help you with any work you cannot do.

Write as decimals correct to two decimal places. Use fractions if necessary, as $\frac{1}{6} = .16\frac{2}{3}$.

1. $\frac{3}{5}$ $\frac{13}{20}$ $\frac{1}{15}$ $\frac{5}{8}$ $\frac{5}{6}$ $\frac{4}{9}$

Write as common fractions in lowest terms.

2. .35 .75 .08 $.03\frac{3}{4}$ .005 .02

Find the answers.

3. $1.4+8.3+7.6+9.3$ $7.36+8.25+4.42$

4. $.1862+1.3409+67.1840+.0046$

5. $402.1-108.4$ $100.201-71.384$

6. $6000-.0049$ $45.1709-6$

7. 6.31×8.46 873.2×27.9

8. $173.16\div18$ $1193.0644\div87.34$

Change to per cents.

9. $\frac{2}{5}$ .14 $\frac{1}{4}$ .07 .001 1.5

10. $\frac{4}{3}$ .80 $\frac{1}{200}$ .15 $\frac{1}{2000}$ 2

Change to common fractions in lowest terms.

11. $33\frac{1}{3}\%$ $7\frac{1}{2}\%$ $12\frac{1}{2}\%$ $6\frac{2}{3}\%$ $87\frac{1}{2}\%$

Change to decimals.

12. 12% 6% 125% 200% .4% $\frac{1}{5}\%$

Write the number that belongs in each blank.

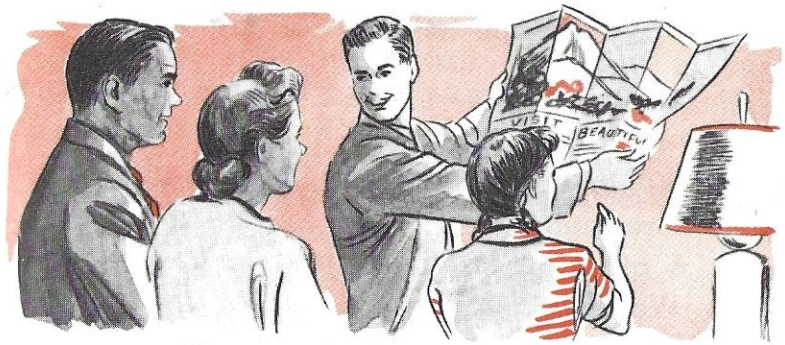
13. 5% of 240 = __ $12\frac{1}{2}\%$ of 160 = __

14. 125% of 96 = __ .5% of 200 = __

15. __% of 24 = 8 __% of 16 = 24

16. 10% of __ = 12 $112\frac{1}{2}\%$ of __ = 180

17. .1% of __ = 4.2 __% of 1000 = 2



Thrift with a Purpose

John and Alice saw a "Travel-Talk" at a picture show. They wanted to make a trip west to see the sights. Their parents said they did not have the money to make such a trip.

The whole family talked matters over. The only way they could manage to go would be to spend less on other things. Each agreed to save on everything he could in order that they might afford the trip.

This was the monthly budget as it had been:

Housing	$60.00
Operating Expenses	33.00
Food	90.00
Clothing	30.00
Education and Recreation	15.00
Transportation	15.00
Savings and Insurance	30.00
Health and Personal Care	15.00
Other	12.00

John Helps to Save for the Trip

1. Last month John's father had spent for transportation:

20 gal. of gasoline at 25¢ a gallon	
Greasing	$1.00
5 qt. of oil at 35¢ a quart	
Wash and polish	$3.50
Puncture repaired	$ .50

What was the total cost of transportation?

2. It costs $1.50 to have the car washed and $2 to have it polished. The budget allows for a wash each month and a polish every two months. How much can John save if he washes and polishes the car for a year?

3. John's father had used gasoline that cost 25¢ a gallon. He averaged 12.5 mi. to the gallon. John found that with another kind of gasoline that cost 28¢ a gallon his father could average 16.0 mi. to the gallon. If the father drove an average of 10,000 mi. a year, how much could he save in a year by using the better gasoline?

4. Tires that would last about 15,000 mi. cost $12.45 each, and tires that will last about 20,000 mi. cost $15 each. The father drives about 10,000 mi. a year. What would be the cost of a year's use of four of the less expensive tires? Of four of the more expensive tires? How much can he save by using the better tires?

5. Oil costs 35¢ a quart. A 5-gallon can of oil costs $5. How much can they save in purchasing a 5-gallon can of oil rather than purchasing it a quart at a time?

6. If a quart of oil is used for each 800 mi. of travel, how many quarts are used in 10,000 mi.? How much can be saved by purchasing this oil in 5-gallon cans rather than by the quart?

7. What is the total of the savings described in Problems 2, 3, 4, and 6 above?

8. Give some reasons why the family should not reduce savings and insurance to save for the trip.

9. Do you believe they should reduce expenditures for health and personal care to save for the trip?

10. What items of operating expenses might be reduced to save for the trip? Consider cost of electricity, gas, water, laundry, help in home, etc.

11. Pretend that you are John. You want to make the trip west very much. The trip will cost about $525 for the family. The family income is only $300 a month, and has been carefully budgeted to provide the family with home, food, and clothing. There is no way of spending the same dollar twice. Would you give up the trip, or would you give up enough other things to pay for the trip? What things would you give up?

Savings that Alice Made

1. Alice found that she could buy soap for 85¢ a dozen cakes. Her mother had been paying 12¢ a cake for the same soap. The family uses a dozen cakes of this soap a month. How much can Alice save in a year by purchasing a dozen cakes at a time?

2. Sugar costs 27¢ for a 2-pound box. Alice can buy 100 pounds for $9.50. If the family uses 400 lb. of sugar a year, how much can Alice save in a year by purchasing sugar in 100-pound bags?

3. Bath towels cost 89¢ each, or $10 for a dozen. How much can Alice save in buying 24 bath towels by the dozen?

4. The regular price of dress goods that Alice needed was $8.70. At a sale she was able to buy it at $33\frac{1}{3}\%$ less than the regular price. How much did she save?

5. The regular price of a supply of dish towels was $9.60. At a sale Alice was able to buy for 25% less than the regular price. How much did she save?

6. Corn was 18¢ a can, or a case (24 cans) for $2.88. How much can Alice save in buying a case?

7. Alice saved 45¢ in buying a house dress at a sale. If the discount was $33\frac{1}{3}\%$, what was the regular price of the dress?

Total Savings for the Year

1. John and Alice helped to save for the trip, and they kept an accurate account of the savings. Supply reasonable amounts in place of the question marks below, and find the total of the savings.

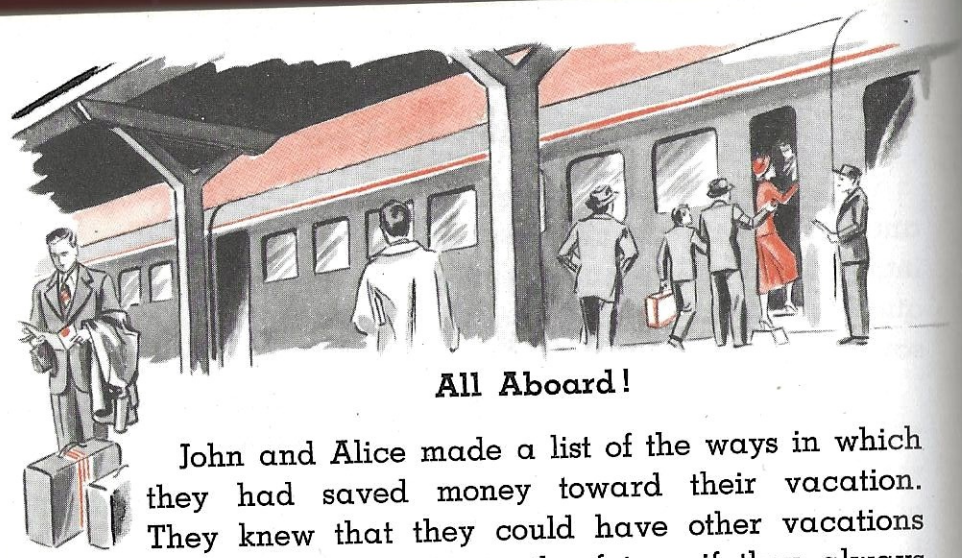
From Operating Expenses	$16.80
From Food	56.40
From Clothing	?
From Education and Recreation	?
From Transportation	?
From Other	?
	?

2. They decided that since they would be on the trip a full month, they could add to the amount saved the food and transportation allowance for the month, and half of the amounts allowed for operating expenses and for education and recreation. What is the total of these added amounts?

3. The father said that since they had all worked together in saving, he would take enough from his savings account to finish the $525 needed. How much did he take from his savings account?

4. Alice bought a pair of hiking shoes for $9.60. The regular price had been $12. What was the per cent of discount?

5. John bought a camera for $14.40. The regular price had been $18. What was the per cent of discount?



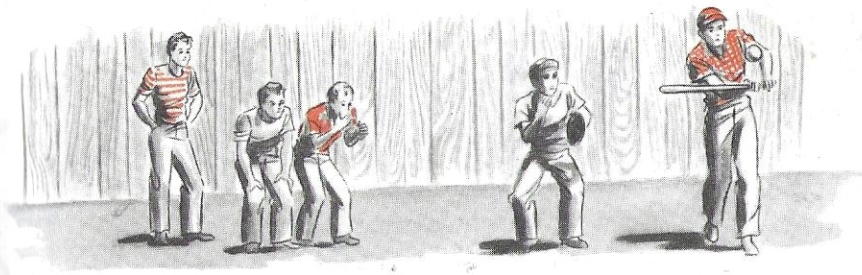
All Aboard!

John and Alice made a list of the ways in which they had saved money toward their vacation. They knew that they could have other vacations and extra pleasures in the future if they always helped their parents reduce the cost of living. They made a list of the ways in which they had managed to save money:

1. Doing extra work instead of hiring outside help
2. Buying in large quantities so as to get reductions
3. Buying good quality that would outlast poorer quality at a lower price
4. Watching for special sales and buying their supplies when discounts were given
5. Planning carefully so that they did not buy things they did not need

The whole family agreed that these were very simple but practical ways in which to use thrift in spending and to save money.

Are there any ways in which you might help your family save money?



Your Turn at Bat

1. A furniture dealer offered 15% discount for cash payment on merchandise in his store. A bill of sale included a living room set at $340.00, a refrigerator at $215.00, and a cedar chest for $78.00. How much discount was given for cash?

2. Mr. Hart bought coal in August because the price was then $17.50 a ton. What did he save on 9 tons if the same coal cost $19.00 in September? What per cent of the September price did he save?

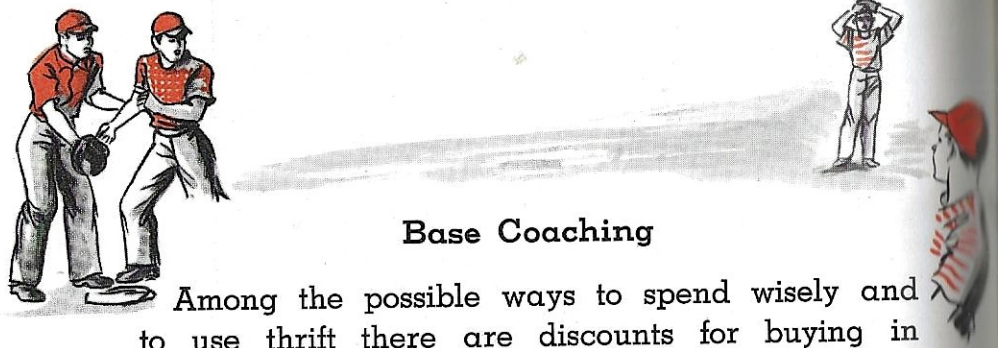
3. Ann pays 12¢ a pound for sugar in small quantities. A 10-lb. sack costs 98¢. If she uses 20 lb. a month, what will she save by buying in 10-lb. sacks?

4. Mrs. Hart bought a large supply of groceries that she might get a discount for buying in large amounts. Find her saving on the order below.

1 doz. cans of pears for $2.89, regularly 30¢ a can

2 doz. cans of apricots for $6.25, regularly 35¢ a can

Work page 195 if you made no mistakes. Otherwise, work page 194.



Base Coaching

Among the possible ways to spend wisely and to use thrift there are discounts for buying in large amounts, seasonal sales, cash discounts, and getting the most for your money. Caution must be used so inferior goods will not be bought because of lower cost. Damaged goods and soiled merchandise are sometimes sold at lower prices. Rarely are these really bargains.

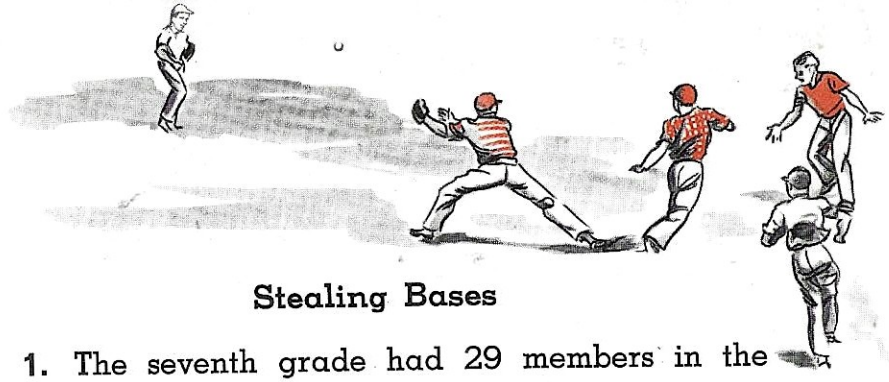
It must be remembered, too, that buying on the installment plan, small orders, and buying unknown brands may also lead to waste and extravagance in spending.

1. Explain how installment buying increases the cost of an article. When is installment buying justifiable?

2. What precaution should be taken when buying in large quantities?

3. A printing concern offered a box of stationery containing 300 sheets and 150 envelopes for $2.00. A double order cost $3.00. What per cent was saved by taking the double order?

4. A kitchen cabinet marked $48.00 could be bought for $12.00 cash and twelve payments of $4.00. What was the per cent of saving in paying cash?



Stealing Bases

1. The seventh grade had 29 members in the class, and each one subscribed for a current events magazine at 35¢ a semester. If as many as 30 pupils subscribed, the price would be 30¢ each. Jane suggested that the class order 30 subscriptions to get the lower rate. How much would this save?

2. The publishers also gave a current events map valued at $1.50 with 30 subscriptions. What would be the better way to get the map, buy it or get 30 subscriptions instead of 29?

3. Carl's father wanted to try a magazine that had been recommended to him. It was 10¢ per copy on the newsstand, $4.00 per year, or $2.00 for a trial subscription of 40 weeks. How much would a single copy cost if bought each of these ways?

4. The school cafeteria sold plate lunches of two vegetables, bread, and a drink or dessert for 25¢. If bought separately each vegetable dish cost 9¢, bread 3¢, and a drink or ice cream 8¢. What is saved by buying a plate lunch? How much could be saved in a school year of 200 days by the plate lunch plan?

Crossing Home Plate

1. Find the selling price of an article marked $4.80, if bought at a discount of 20%.

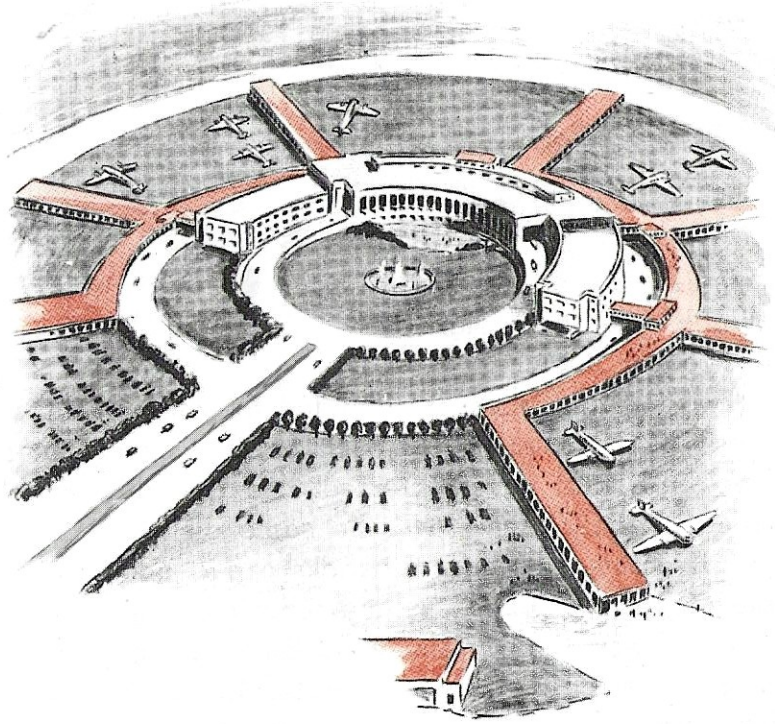
2. What is the extra charge on a radio marked $28.00 if the installment plan has twelve monthly payments of $3.00? What per cent of the marked price is the extra charge?

3. What is saved by buying peaches marked 18¢ a can by the dozen at $1.40 a dozen? What per cent of the regular price is the amount saved?

4. A bicycle marked $42.00 was bought on the budget, or installment plan. The purchaser paid $14.00 cash and $5.00 a month for 8 months. How much did he pay for the bicycle? What per cent of the marked price was the entire cost?

5. A ton of coal which cost $18.00 in November could be bought for $15.00 in August. How much is saved by buying 5 tons in August? What per cent of the regular price is saved?

6. A doctor who discounts his bills 5% for payment within 10 days of the receipt of the bill collected $9.50 from one patient. What did the patient owe? What did the patient save?

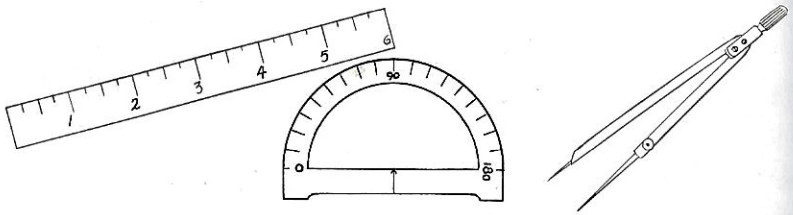


Unit Eight

The Geometry of Shape

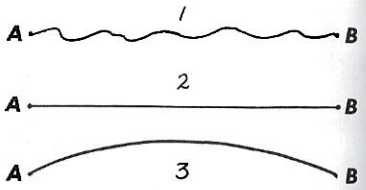
Most of the shapes about us are made up of simple geometric forms. Architects, designers, and planners of all sorts use these simple forms. The designer of the world's greatest airport used only circles and straight lines.

In this unit, you will learn how to draw simple geometric forms and to fit them together into beautiful and useful patterns.



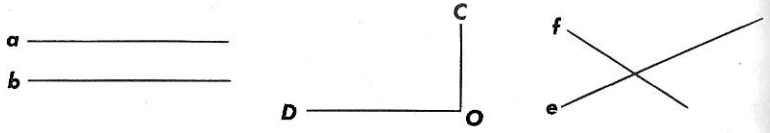
Simple Forms and Tools to Make Them

A straight line is the shortest distance between two points. Which line at the right is a straight line?



Two straight lines, if extended far enough either cross each other **(intersect),** or they never meet. Two lines that never intersect are called **parallel lines.** Parallel lines are the same distance apart at all points. Street car tracks are a good example of parallel lines. Name some other examples.

Two lines that intersect so as to form a right angle are called **perpendicular lines.** The sign for parallel is ∥, and the sign for perpendicular is ⊥.



Parallel Lines Perpendicular Lines Intersecting Lines

A **vertical line** *is directly up and down.*

A **horizontal line** *is level, like a pencil floating in water.*

An **oblique line** *is neither vertical nor horizontal. Draw an oblique line.*

Oblique Line Vertical Line Horizontal Line Perpendicular Oblique Lines Parallel Oblique Lines

Lines

A line may be named by two capital letters at different points of the line or by one small letter.

You may use the straight edge of a ruler to draw a straight line. You may use the marks on the ruler or you may use a compass to mark off a line of definite length. A line of definite length is a **line segment.** The protractor is used in measuring or drawing angles. Compasses are used to draw circles or parts of circles. Parts of circles are called **arcs.**

In constructing geometric figures, it is often best to begin by drawing a line. Call this beginning line the **work line,** for we work on and from this line in drawing the remainder of the figure.

1. If one of two parallel lines is vertical, what will be the direction of the other?

2. If one of two parallel lines is horizontal, what will be the direction of the other?

3. If one of two perpendicular lines is vertical, what will be the direction of the other?

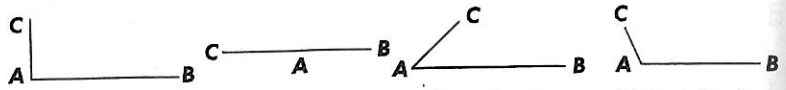
4. If one of two perpendicular lines is oblique, what will be the direction of the other?

5. Name as many geometric forms as you can in the picture on page 197.

6. Look in books, magazines, and newspapers for simple geometric forms.

Angles

Two straight lines that form an angle are called the **sides** of the angle, and the point at which they meet is called the **vertex** of the angle.



An angle is measured in degrees. The sign for degrees is °.

There are 90 degrees (90°) in a **right angle.**

There are 180 degrees (180°) in a **straight angle.**

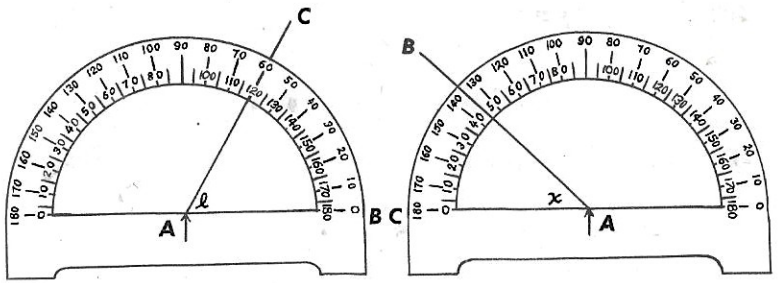
An **acute angle** *is less than a right angle.*

An **obtuse angle** *is greater than a right angle but less than a straight angle.*

The size of an angle does not depend upon the length of its sides.

The straight edge of a protractor may be thought of as a straight angle. The outer arc of the protractor is divided into degrees and numbered, right to left, from 0 to 180. The inner arc is divided into degrees and numbered, left to right, from 0 to 180.

To measure an angle, one may place the notch of the protractor at the vertex and the straight part of the protractor along the right side, *AB*, of the angle. The point at which the left side, *AC*, of the angle crosses the outer arc of the protractor gives the number of degrees in the angle.



In measuring an angle, it is sometimes better to place the notch of the protractor at the vertex and the straight part along the left side, *AC*, of the angle. Then, the point at which the right side, *AB*, crosses the inner arc of the protractor gives the number of degrees in the angle.

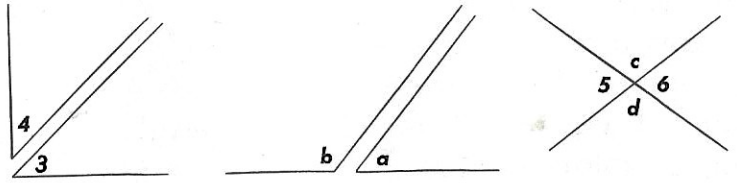
An angle is named by a number or small letter written within the angle, as angle *1* or angle *x*, or an angle is named by three capital letters, one at the vertex and one on either side, as angle *BAC*.

1. How many degrees in angle *1*? In angle *x*?

2. Two angles are **complementary** if their sum is 90°. Measure angles *3* and *4*.

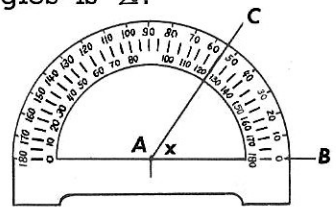
3. Two angles are **supplementary** if their sum is 180°. Measure angles *a* and *b*.

4. When two straight lines intersect, the pairs of opposite angles are called **vertical angles.** *Vertical angles are equal.* Measure angles *5* and *6*. Measure angles *c* and *d*.



Constructing Angles

The sign for angle is $\angle$, and the sign for angles is $\measuredangle$.



These are the steps in constructing $\angle x = 55°$.

a. Draw any work line AB.

b. Place the notch of the protractor at A and the straight part of the protractor along AB.

c. Find a point marked 55 on the outer arc of the protractor. Make a dot on your paper at this point, and call it C.

d. Remove the protractor and draw line AC.

Then, $\angle BAC = \angle x = 55°$.

Construct the following angles.

1. $\angle a = 50°$ **3.** $\angle c = 30°$ **5.** $\angle e = 105°$

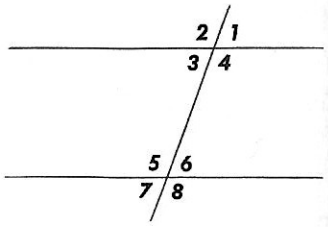
2. $\angle b = 78°$ **4.** $\angle d = 85°$ **6.** $\angle f = 150°$

7. Construct a right angle (90°).

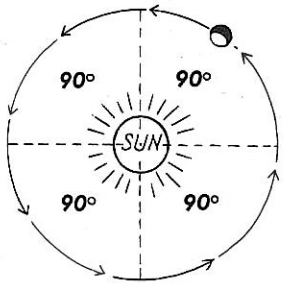
8. Construct an angle equal to $\angle 4$ on page 201. (Hint: Find the number of degrees in angle 4 by measuring it.)

9. Construct an angle equal to $\angle b$ on page 201.

10. Find the number of degrees in each angle at the right. Find several pairs of equal angles. Name several pairs of supplementary angles.



Angles and Time



The Wise Men of Babylonia studied astronomy many thousands of years ago. They believed the earth made a complete revolution about the sun in 360 days. In one day, then, the earth would make $\frac{1}{360}$ of a complete revolution. Our division of a whole circle into 360 equal parts, or a quarter circle into 90 equal parts, came from these ancient Babylonians.

1. At 3 o'clock the hour hand and the minute hand of a clock form an angle of 90°. Explain.

2. At 1 o'clock the hour hand and the minute hand form an angle of 30°. Explain.

How many degrees in the angle formed by the hour hand and the minute hand when the time is:

3. 2 o'clock 5 o'clock 11 o'clock

4. 4 o'clock 6 o'clock 10 o'clock

5. The minute hand moves through 30° in 5 minutes. Explain.

Through how many degrees does the minute hand move from:

6. 8:15 to 8:20 10 to 10:15 1:45 to 2:10

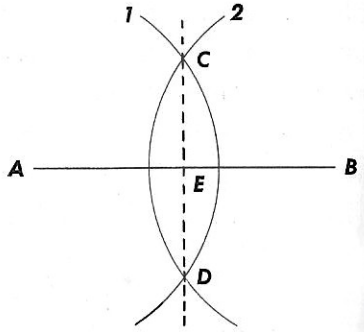
7. 9:20 to 9:30 10:40 to 11 3:40 to 4:05

If it is 9:20 A.M. now, what time will it be when the minute hand has moved through:

8. 30°; 60°; 90°; 42°?

Using Compasses

To **bisect** any line segment, AB, means to find its midpoint.



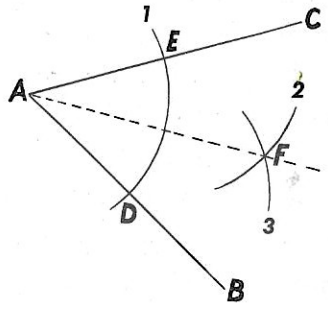
a. Open the compass so that the points extend more than half the length AB.

b. Place the steel point at A and draw arc 1.

c. Place the steel point at B and draw arc 2, intersecting arc 1 in C and D.

d. Draw a line through C and D to cross AB at E.

E is the midpoint of AB.



CD is perpendicular to AB. CD is called the **perpendicular bisector** of AB.

To bisect an angle BAC means to draw, through the vertex, a line that divides the angle into two equal parts.

Place the steel point of the compass at A and draw arc 1 crossing AB at D and crossing AC at E.

Explain the other steps needed to bisect angle BAC. AF bisects angle BAC.

Compasses may be used to construct a line segment equal to a given line segment, AB.

a. Draw any work line w and mark any point on it as C.

b. Place the steel point of the compass at A and the pencil point at B.

c. Without changing distance between points, place the steel point at C and draw an arc crossing w at D.

Line segment CD is equal to AB.

1. Using the ruler alone, construct a line segment equal to AB.

2. Using ruler and compass, construct a line segment equal to the whole of w.

3. Using the ruler alone, bisect the line segment you constructed in 1.

4. Using ruler and compass, bisect the line segment you constructed in 2.

5. Use the protractor to construct an angle of 78°. Use the protractor to bisect this angle.

6. Use the protractor to construct an angle of 54°. Use a compass to bisect this angle.

7. Draw and bisect an acute angle; a right angle; an obtuse angle; a straight angle.

8. Draw a vertical line segment about 3 inches long. Use a compass to bisect it.

9. Draw an oblique line segment about 3 inches long. Use a compass to bisect it.

Harder Work with the Compass

The compass may be used to construct an angle equal to a given angle *BAC*.

a. Draw any work line *DE*.

b. Place the steel point of the compass at *A* and draw arc *1* crossing *AB* at *G* and *AC* at *H*.

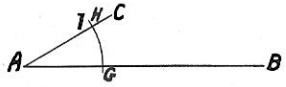
c. Place the steel point of the compass at *D* and without changing distance between points, draw arc *2* crossing *DE* at *J*.

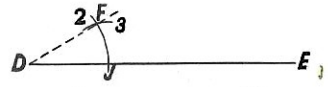
d. Place the steel point at *G* and the pencil point at *H*.

e. Place the steel point at *J* and without changing distance, draw arc *3* cutting arc *2* at *F*.

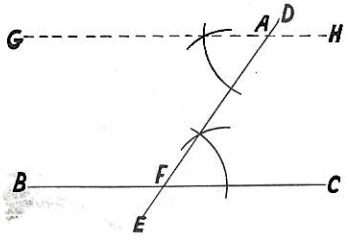
f. Draw *DF*.

Angle *EDF* is equal to angle *BAC*.





One may use a compass, too, in constructing a line through a given point *A* and parallel to a given line *BC*.

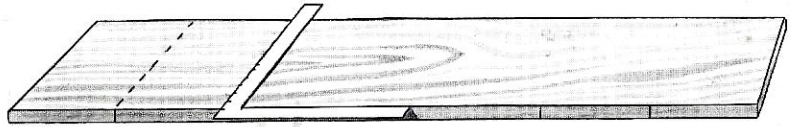


a. Draw any line *DE* through *A* and crossing *BC* at *F*.

b. Use the method explained above, and construct angle *FAG* equal to angle *CFA*.

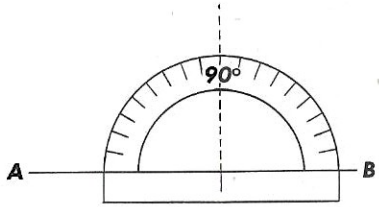
c. Extend line *GA* to *H*.

Line *GH* passes through *A* and is parallel to *BC*.



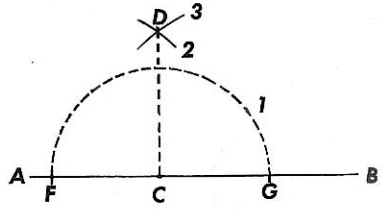
When a carpenter needs to draw a line perpendicular to a given line at a given point, he uses a square.

A protractor can also be used to construct a line perpendicular to another line at any given point.



A third way is with a compass. The given line is *AB*, and the given point is *C*.

a. Place the steel point at *C* and draw arc *1* crossing *AB* at *F* and *G*.



b. Open the compass so that the distance between points is more than half *FG*.

c. Place the steel point at *F* and draw arc *2;* place the steel point at *G* and draw arc *3,* crossing arc *2* at *D*.

d. Draw *CD*.

CD is perpendicular to *AB* at *C*.

1. Draw a line *AB* about 6 inches long and mark a point *C* about 2 inches from one end. Construct a line perpendicular to *AB* at *C*.

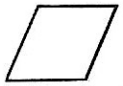
2. Draw any line *AB* and a point *C* about 2 inches above *AB*. Draw a line through *C* and parallel to *AB*.

Drawing Easy Quadrilaterals

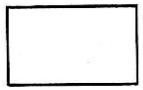
Any figure that has four lines as sides is called a **quadrilateral.** *There are many sorts of quadrilaterals.*

1. *A* **square** *has four equal sides and each angle is a right angle.* Construct a square with side equal to 3 in.

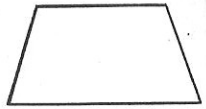
2. Construct a quadrilateral with each side equal to 3 in. but with angles which are not right angles. This figure is called a **rhombus.**



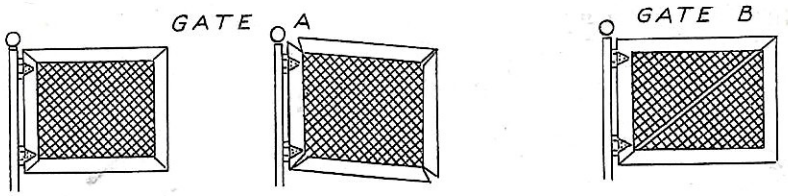
3. *Each angle of a* **rectangle** *is a right angle, and the opposite pairs of sides are equal and parallel.* Construct a rectangle 4 in. long and $2\frac{1}{2}$ in. wide.



4. *The opposite sides of a* **parallelogram** *are equal and parallel, but its angles are not right angles.* Construct a parallelogram with two sides equal to 4 inches and $2\frac{1}{2}$ inches, and with an angle equal to 60°.



5. *A* **trapezoid** *is a quadrilateral having one and only one pair of sides parallel.* These parallel sides are not equal. Construct two different trapezoids whose parallel sides measure 6 in. and 4 in.

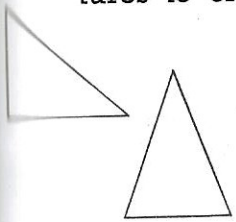


Triangles

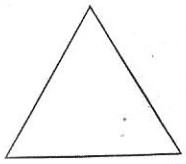
The frame of gate *A* is a quadrilateral. When there is pressure, the quadrilateral changes shape and the gate sags.

Two triangles form the frame of gate *B*. The shape of a triangle cannot be changed by pressure. Gate *B* will not sag.

1. Triangles are used in the framework of buildings or bridges to make them strong. Bring pictures to class to show this.



2. *A* **right triangle** *has one right angle.* Construct a right triangle with the sides of the right angle equal to 3 in. and 4 in.

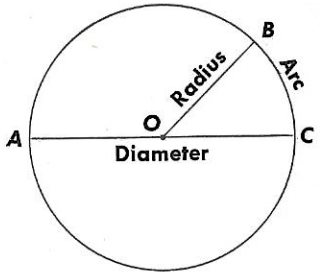


3. *An* **isosceles** *triangle has two equal sides.* Construct an isosceles triangle with equal sides each equal to 2 in. and with the angle between them equal to 40°.

4. *An* **equilateral** *triangle has three equal sides,* and each angle is equal to 60° Construct an equilateral triangle with each side equal to 3 in.

5. *A* **scalene** *triangle has no two sides equal and no two angles equal.* Construct one.

Drawing Circles



The center of circle O is at O.

The **diameter** of a circle is a line passing through the center and connecting two points, as A and C, of the circle.

A **radius** connects the center with any point, as B, of the circle.

An **arc,** as BC, is a part of a circle.

Two or more circles with the same center are called **concentric** *circles.*

1. A diameter divides a circle into how many equal parts?

2. Two perpendicular diameters divide a circle into how many equal parts? Draw this figure.

3. A diameter is how many times as great as a radius?

4. Draw four concentric circles, with radii (plural of radius) equal to $1\frac{3}{4}$ in., 2 in., $2\frac{1}{2}$ in., and 3 in.

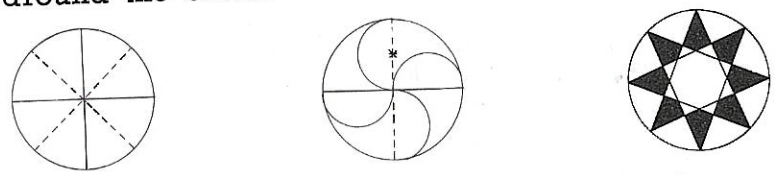
5. Draw four concentric circles with diameters equal to 3 in., $4\frac{1}{2}$ in., 5 in., and 6 in.

6. Tell how concentric circles and each of the following are related: (a) rings formed when a stone is dropped into still water; (b) a circular pool surrounded by a circular walk; (c) rings on a log sawed across the grain; (d) a target.

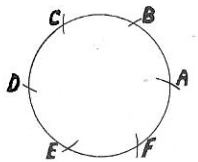
Arithmetic and Art

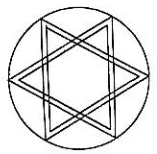
Many beautiful patterns are made with circles and with the regular figures drawn in (**inscribed in**) the circles.

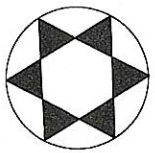
The ends of two perpendicular diameters mark four points, equally spaced around the circle. If the angles between the perpendicular diameters are bisected, the bisecting lines will mark four other points, to make eight points equally spaced around the circle.



A circle can be divided into six equal parts by placing the steel point of the compass at any point, as A, and, with distance between points equal to the radius of the circle, marking point B. Then, place the steel point at B and mark C, and so on.







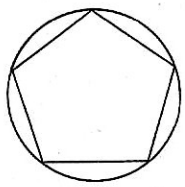
Magnified snow crystals appear as regular six-sided figures. These are called **hexagons.**

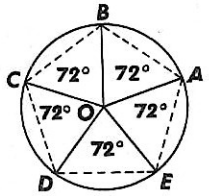
Making a Five-Pointed Star

A regular **pentagon** *has five equal sides and five equal angles.* One may construct a regular pentagon by dividing a circle into five equal parts and joining these points in order with straight lines.

One way to divide a circle into five equal parts is to draw a radius OA, and then draw the angles AOB, BOC, COD, and DOE each equal to 72°. Angle EOA will also be equal to 72°. We use 72° because there are to be five equal angles, and $\frac{360°}{5} = 72°$.

If the circle is divided into five equal parts and the alternate points of division are joined, one has a five-pointed star.





1. Inscribe a regular pentagon in a circle with radius 2 in.

2. Construct a five-pointed star in a circle with radius $2\frac{1}{2}$ inches.

3. Name some uses of the five-pointed star.

Petunia

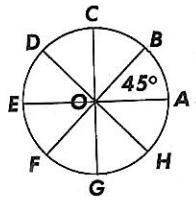
Delphinium

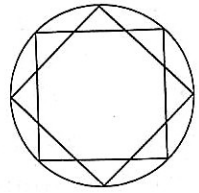
Four-O'Clock

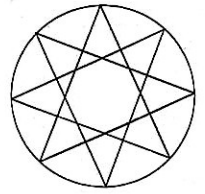
Making Many-Pointed Stars

The method explained on page 212 may be used to construct stars with any number of points.

In constructing an eight-pointed star, you divide the circle into 8 equal parts and join the points of division. Draw any radius OA and construct angles AOB, BOC, COD, and so on each equal to 45°. We use 45° because there are 8 equal angles and $\frac{360°}{8} = 45°$.







You may join every second point (A to C, B to D, and so on). This makes the star in the middle.

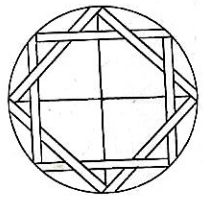
You may join every third point (A to D, B to E, and so on). This makes the star at the right.

1. How many degrees would be in angle AOB to divide the circle into 10 equal parts?

2. How many degrees would be in angle AOB to divide the circle into 15 equal parts?

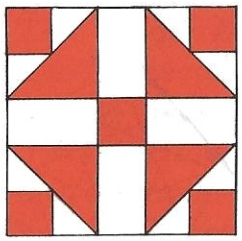
3. Draw a circle with radius 2 inches and construct a star like the one in the middle above.

4. Draw a circle with radius 2 inches and construct a star like the one at the right above.

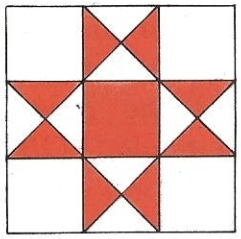


5. Copy this design.

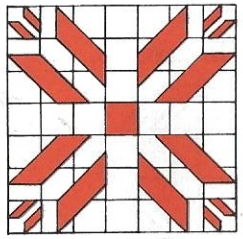
Patchwork Quilts



Wild Goose Chase



Variable Star



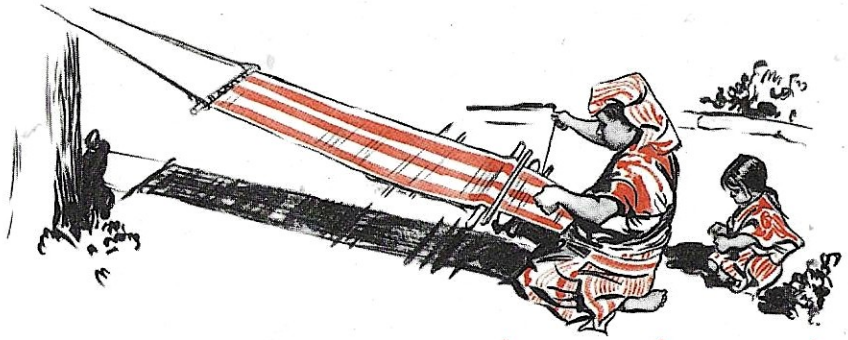
Bear's Paw

Patchwork quilts are beautiful for bed coverings. Your great-grandmother took pride in her beautiful quilts. Patterns for three different squares are shown at the left. Sometimes patchwork squares are fitted together solidly to make a quilt. Sometimes the patchwork squares alternate with squares of a solid color or white.

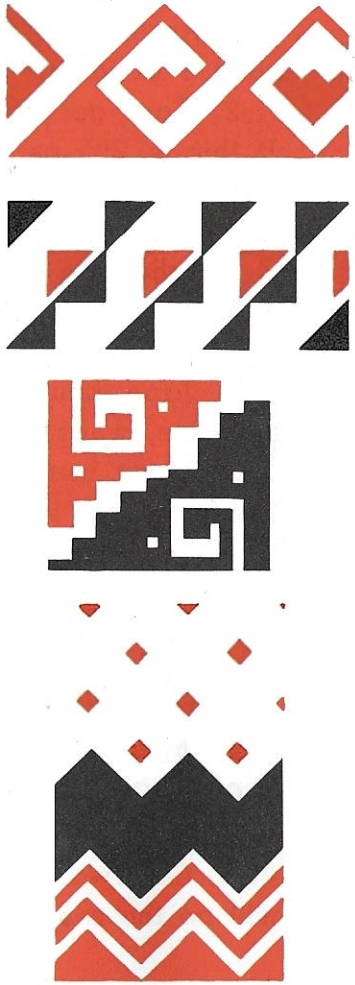
1. Copy each pattern at the left carefully and neatly.

2. Try to find answers to these questions: In making a quilt, how large should each square be? How many squares would be needed to make a full-size quilt?

3. Let those of the class who are good artists draw patchwork squares, of the same pattern, 9 inches on a side. Fit these together in class to show how the quilt as a whole looks.



Indian Designs



The Indians of America wove geometric shapes into their baskets and blankets and painted geometric shapes on their vases. The designs shown on this page were actually used by Indians.

1. Copy the designs at the right.

2. Bring to class copies of any Indian designs you can find.

3. Indian designs are most often used in borders. Lengthen or enlarge or repeat one of the designs at the right. You can do this on wrapping paper.

4. Bring to class copies of tile, linoleum, or other geometric designs you may find.

Developing Power in Problem Solving

No pencils, please!

1. Ann had 15 towels to hem. She has finished 9 of them. What part of her work is done?

2. Tom got $3 interest on his bank account. If this is 2% or $\frac{1}{50}$ of the amount he has in the bank, how much has he in the bank?

3. Jerry sold his bicycle for $16. If this was $\frac{2}{7}$ of what the bicycle cost, what did it cost?

4. Ellen has 144 sheets of paper. If 24 sheets are green, what part of her paper is green?

5. Jane bought $\frac{5}{8}$ yd. of linen for $.95. At this rate, what is the cost of a yard?

6. Mary used $2\frac{1}{4}$ lb. of sugar. If sugar costs 10¢ a pound, what did the sugar cost?

7. Tom played 18 games of table tennis. He lost $\frac{1}{6}$ of the games. How many games did he win?

8. Mr. West bought 10 doz. oranges at $.50 a doz. and sold them at 3 for 20¢. What did he make?

9. At 2 for 15¢, what will I pay for 50 pencils?

10. If 2 tons of coal cost $35.75, what will 4 tons cost?

11. Celery is selling at 3 stalks for 55¢. What will be the selling price of 24 stalks at this rate?

12. Last year Mr. Wells picked 750 bu. of apples from his orchard. If 500 bu. were first grade, what part of the crop was this?

13. Mrs. Brown bought a coat marked to sell at $150.00. If she received $\frac{1}{3}$ off the marked price, what did she pay for the coat?

14. Mr. Jones bought a house for $11,500. If this is $\frac{2}{3}$ of the price for which he sold the house, what was the selling price?

15. Mr. Rick buys dresses at $4.00 each. He wants to "mark them up" so that $\frac{1}{5}$ of the selling price will be margin. How many fifths of the selling price is $4.00? What is the selling price?

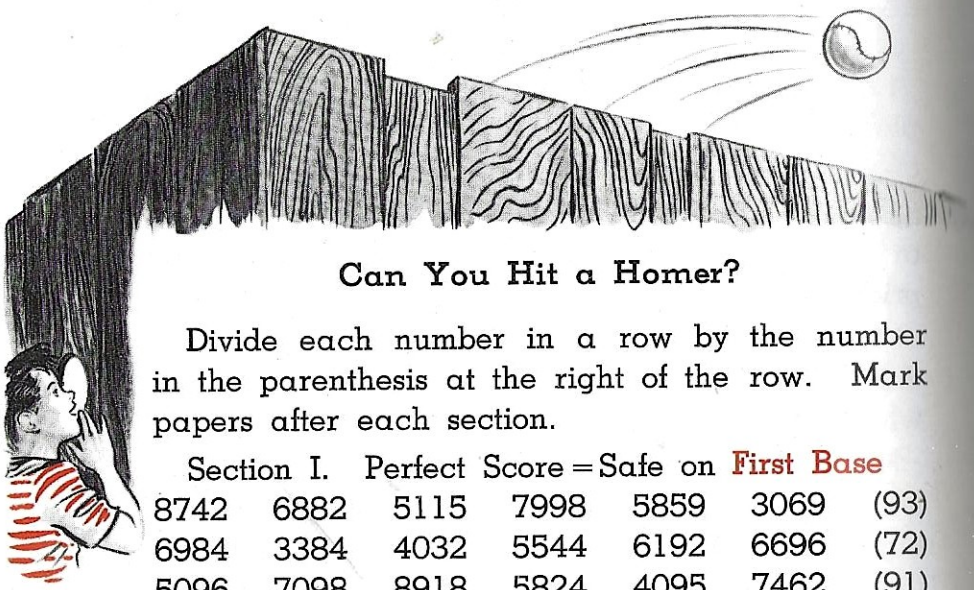
16. Mark goods costing $10.00 so that $\frac{1}{3}$ of the marked price will be margin. (Hint: How many thirds of the marked price is $10.00?)

17. Last year Henry saved $120. This year he saved only $\frac{4}{5}$ as much. How much did he save this year?

18. This year Ellen spent only $\frac{7}{8}$ as much as she spent last year for clothes. If she spent $105.00 this year, what did she spend last year?

19. Last year Ellen spent $28.35 for recreation. This year she spent $\frac{5}{6}$ as much as last year. How much less did she spend this year?

20. Tom sold his bicycle at a loss of $\frac{1}{3}$ of the cost. He sold it for $20. What was the cost? How many dollars did he lose?



Can You Hit a Homer?

Divide each number in a row by the number in the parenthesis at the right of the row. Mark papers after each section.

Section I. Perfect Score = Safe on First Base

8742	6882	5115	7998	5859	3069	(93)
6984	3384	4032	5544	6192	6696	(72)
5096	7098	8918	5824	4095	7462	(91)
3564	4004	3168	2376	1892	1584	(44)

Section II. Perfect Score = Safe on Second

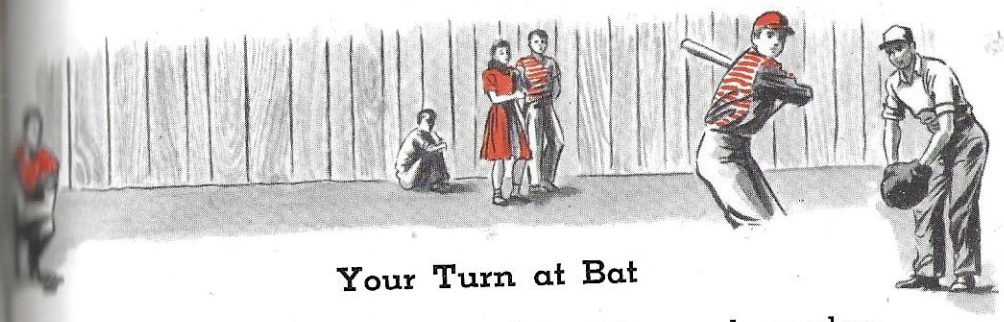
5358	6016	6674	4042	7708	2632	(94)
2790	1935	2385	1575	1170	765	(45)
4745	1755	2925	4030	5265	5980	(65)
1518	2376	4026	5346	4752	3564	(66)

Section III. Perfect Score = Safe on Third

6232	5396	4104	1976	2812	4864	(76)
7968	5376	6048	7104	8736	4224	(96)
969	1425	2451	2907	1482	1881	(57)
1479	2349	5568	6351	7134	2175	(87)

Section IV. Perfect Score = Safe at Home

2288	3784	4576	6248	5544	3168	(88)
588	1127	1568	686	1519	637	(49)
1326	3354	4836	5538	4056	2730	(78)
1691	2314	3026	4717	5429	3738	(89)



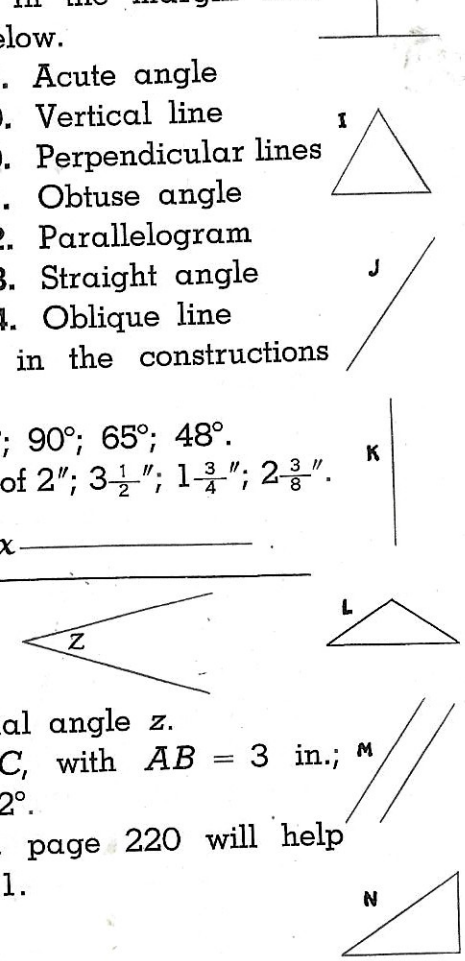
Your Turn at Bat

Write the numbers 1 to 14. After each number write the letter of the figure in the margin that identifies the figure named below.

1. Parallel lines
2. Right angle
3. Trapezoid
4. Rectangle
5. Equilateral triangle
6. Right triangle
7. Isosceles triangle
8. Acute angle
9. Vertical line
10. Perpendicular lines
11. Obtuse angle
12. Parallelogram
13. Straight angle
14. Oblique line

Use protractor and ruler in the constructions below.

15. Construct angles of 30°; 90°; 65°; 48°.
16. Construct line segments of 2″; $3\frac{1}{2}$″; $1\frac{3}{4}$″; $2\frac{3}{8}$″.
17. Draw a vertical line exactly as long as line x.
18. Draw an oblique line exactly as long as line y.
19. Draw an angle to equal angle z.
20. Draw a triangle ABC, with $AB = 3$ in.; $AC = 2\frac{1}{2}$″; and angle $C = 42°$.



If you made 4 mistakes, page 220 will help you. Others work page 221.

Base Coaching

1. Use a ruler to draw a line segment AB, 3 inches long.

2. Use the ruler to find the midpoint of AB.

3. Use a ruler to draw a base line w, about 6 inches long. Use a compass to mark off on line w a line segment CD, equal to AB.

4. Use the compass to find the midpoint of CD.

5. Use the ruler and protractor to draw an angle $BAC = 48°$.

6. Use the ruler and protractor to bisect angle BAC.

7. Use the compass and ruler to construct an angle EDF = angle BAC.

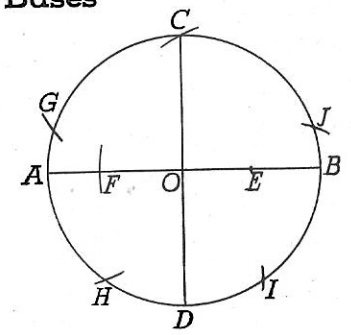
8. Use the compass and ruler to bisect angle EDF.

9. Draw a line GH and mark any point on GH as K. Use the protractor and ruler to construct a line KL, perpendicular to GH at K.

10. Draw a line MN and mark any point on MN as P. Use the compass and ruler to construct a line PQ, perpendicular to MN at P.

11. Draw three concentric circles with radii of $1\frac{1}{2}$ in., 2 in., and $2\frac{1}{2}$ in.

Stealing Bases



1. Study this new way of drawing a regular pentagon.

a. Draw a circle O and draw perpendicular diameters AB and CD.

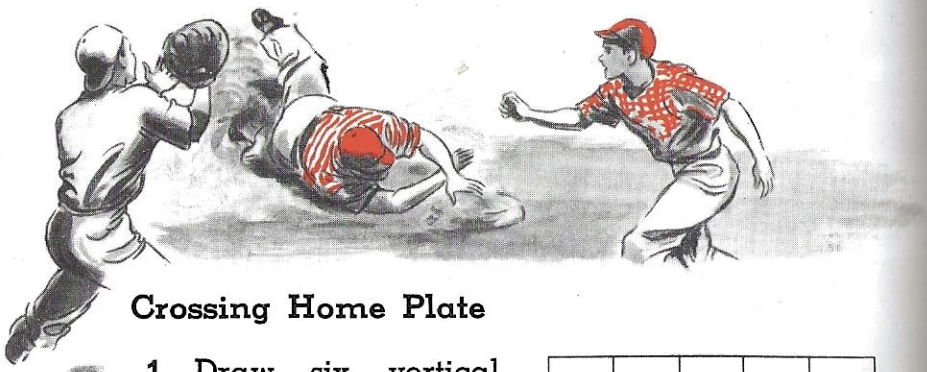
b. Bisect radius OB at point E.

c. Place the steel point of the compass at E and the pencil point at C. Without changing the distance between the points, draw an arc crossing OA at F.

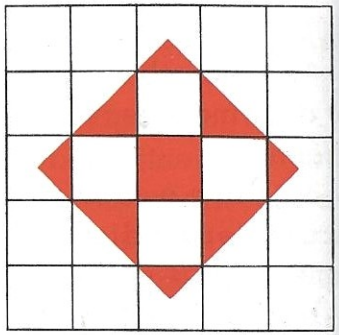
d. Place the steel point at C and the pencil point at F. Without changing the distance between the points, draw an arc crossing the circle at G. Then place the steel point at G and draw an arc crossing the circle at H, and so on around to J.

If you join the points C, G, H, I, and J in order, you will have a regular pentagon. If you join alternate points, you will have a five-pointed star.

2. Inscribe a 5-pointed star in a circle.



Crossing Home Plate



1. Draw six vertical lines and six horizontal lines, as shown at the right. Copy the design.

2. Use ruler and protractor to construct an angle equal to 64°.

3. Draw any acute angle. Use ruler and protractor to bisect the angle that you drew.

4. Draw any obtuse angle. Use ruler and protractor to bisect the angle that you drew.

5. Draw a circle with radius $2\frac{1}{4}$ inches. Draw a six-pointed star in this circle.

6. Draw any angle BAC equal to about 50°. Use a compass to bisect angle BAC.

7. Draw two angles that are complementary. How many degrees are in each angle?

8. Draw two angles that are supplementary. How many degrees are in each angle?

9. Draw two vertical angles. Write x within one angle and y within the other. How many degrees are in each angle?

Unit Nine

The Beginning of Units of Measure

In the beginning of civilization men used natural units for units of measure. The inch in Scotland was the average width of three thumbs: a large thumb, a middle-sized thumb; and a small thumb. In England the inch was the sum of the lengths of three large grains of barley. The foot was the length of a man's foot. The yard was the distance around a man's waist, or the distance from the tip of his nose to the end of the thumb of his outstretched arm.

Measures of Length

12	inches	(in.)	= 1 foot (ft.)
3	feet	(ft.)	= 1 yard (yd.)
$5\frac{1}{2}$	yards	(yd.)	= 1 rod (rd.)
$16\frac{1}{2}$	feet	(ft.)	
320	rods	(rd.)	= 1 mile (mi.)
5280	feet	(ft.)	

Other Old-fashioned Measures

The rod, as a unit of measure, was the length of the rod, or pole, that the English farmer used to prod the oxen who pulled his plow. The mile comes from the Latin words, *milia passuum*, which mean 1000 paces. The pace is a double step, and was used in measuring distances marched by Roman soldiers.

The Romans had no good way to write fractions, and they avoided them as much as they could. They divided their foot into twelve equal parts, and called each part an *uncia*, which meant a twelfth, and considered these as new units of measure. Our words *inch* and *ounce* came from the Latin word *uncia*.

It took centuries of trade agreements and laws to fix the lengths of these various units of measure and to relate them into a system like the table given on page 223.

1. If each seller of yard goods used the "tip of own nose to end of own thumb" way to measure a yard, would you want to buy from a man with a long arm or a short one?

2. Would you care to buy from a man who turned his nose toward his thumb as he measured or turned his nose away from his thumb?

3. Find other stories of measures of long ago.

4. Measure the width of a man's thumb. How does the measurement compare with an inch?

5. Measure the length of a man's foot.

6. Measure the length from the tip of your nose to the end of the thumb of your outstretched arm. Is the measurement close to a yard?

7. Take 20 steps in a straight line. Measure the distance. Find the average length of each step. What is the average length of a pace?

8. How many of your steps does it take to make a mile?

9. What protection is it to the buyer or seller to have units of measure fixed by law?

Change:

10. 25 in. to ft. and in. 630 rd. to mi. and rd.

11. 56 in. to ft. and in. 20 ft. to yd. and ft.

12. 1 ft. 6 in. to in. 3 mi. 124 rd. to rd.

13. 1 ft. 4 in. to in. 4 yd. 1 ft. to ft.

Leave all answers below in simplest form.

14. Add:

1 yd.	1 ft. 10 in.
2 yd.	1 ft. 6 in.
1 yd.	2 ft. 9 in.

15. Subtract:

8 mi.	100 rd. 5 yd.
5 mi.	178 rd. 3 yd.

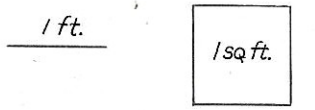
16. Multiply:

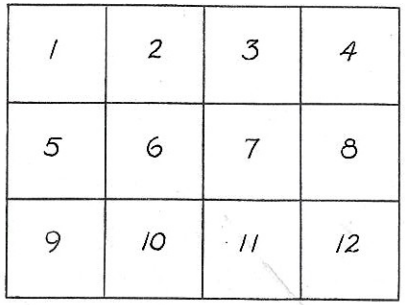
4 yd.	2 ft. 7 in.
	8

17. Divide:

6)33 mi. 124 rd. 2 yd.

Units of Square Measure





A square that is 1 ft. on a side has the area of 1 sq. ft.

1. How many cardboard squares each 1 ft. on a side are needed to cover a table top that is 4 ft. by 3 ft.?

2. Draw a square 1 foot on a side. Divide each side into inch lengths. Draw lines across to divide the square into smaller squares one inch on each side. What is the area of each of the smaller squares? How many square inches are in a square foot?

3. Draw a square yard on the blackboard. Divide it into square feet. How many square feet are there in a square yard?

4. Make a scale drawing of a square rod divided into square yards, using the scale 1 in. = 1 yd. How many square yards are in a square rod?

Most Commonly Used Units of Square Measure

144 square inches (sq. in.) = 1 square foot (sq. ft.)
9 square feet (sq. ft.) = 1 square yard (sq. yd.)
30$\frac{1}{4}$ square yards (sq. yd.) = 1 square rod (sq. rd.)
160 square rods (sq. rd.) = 1 acre (A.)
640 acres (A.) = 1 square mile (sq. mi.)

5. Which of the units above would be used to give the area of the United States?

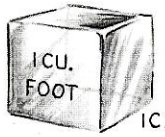
To describe the size of a farm?

To measure the floor space of a home?

6. Find the number of square feet in an acre.

7. Government surveyors laid out public land into **sections** and **quarter sections.** *A section of land is a square measuring a mile on each side.* Make a scale drawing of a section divided into quarter sections. How many acres in a quarter section?

The English farmer prodded his oxen with a rod until they needed to rest. He called this length a furrow-long. We call it a **furlong** (40 rd.). With his rod he measured a distance of 1 rod perpendicular to the furrow he had plowed, and then plowed a return furrow parallel to the first. Then he plowed the land between the furrows, and he called this area a rood. A good plowman could plow four roods a day. This made an acre.



ICE

OIL

WHEAT

Measures of Capacity

A block of ice 1 foot on a side has a volume of 1 cubic foot. A figure, like the block of ice that is shown, has all lines (edges) equal and all angles are right angles. It is called a **cube.**

A cube 1 inch on a side contains 1 cubic inch.

A cube 1 yard on a side contains 1 cubic yard.

1. A truck bed is 9 feet by 6 feet by 3 feet. A dealer packs dishes in cubical boxes a yard on a side. How many such boxes can be packed in the truck bed? What, then, is the volume of the truck bed in cubic yards?

2. How many cubical boxes each a foot on a side can be packed in a truck bed 9 feet by 6 feet by 3 feet? What, then, is the volume of the truck bed in cubic feet?

3. A candy company makes caramels that are cubes an inch on a side. How many caramels of this size can be packed in a cubical box 12 inches on a side? What, then, is the volume in cubic inches of a cubical box 1 foot on a side?

Most Commonly Used Units of Cubic Measure

1728 cubic inches (cu. in.) = 1 cubic foot (cu. ft.)

27 cubic feet (cu. ft.) = 1 cubic yard (cu. yd.)

Liquid measure and dry measure are also measures of capacity or volume.

Liquid Measure	Dry Measure
2 cupfuls = 1 pint (pt.)	2 pints = 1 quart
2 pints (pt.) = 1 quart (qt.)	8 quarts = 1 peck (pk.)
4 quarts (qt.) = 1 gallon (gal.)	4 pecks (pk.) = 1 bushel (bu.)
231 cu. in. = 1 gal.	2150.42 cu. in. = 1 bu.

4. How many half-peck baskets can be filled from 6 bu. of apples?

5. Compare the capacities in cubic inches of a cubical box 1 foot on a side; a five-gallon oil can; a bushel measure.

6. How many cubic inches are in a liquid quart? In a dry quart?

7. Name several things that are sold by liquid measure.

8. Name several things that are sold by dry measure.

Leave all answers below in simplest form.

Add.

9.

cu. yd.	cu. ft.	cu. in.
4	20	675
2	10	980
1	15	495

10.

bu.	pk.	qt.
5	3	2
2	2	5
8	2	4

Subtract.

11.

gal.	qt.	pt.
10	2	1
4	3	1

12.

cu. yd.	cu. ft.	cu. in.
15	10	100
8	10	120

Measures of Weight

Weight—Avoirdupois

16 ounces (oz.) = 1 pound (lb.)
100 pounds (lb.) = 1 hundredweight (cwt.)
2000 pounds (lb.) = 1 ton (T.)

As far back as there is any record, men weighed gold and precious stones. A grain of barley was used as the unit of weight in olden times. There are 7,000 grains in an avoirdupois pound, and 5,760 grains in a troy pound of 12 ounces.

1. Find out all you can about avoirdupois, troy, and apothecary weight measures. What kinds of goods are weighed by each?

2. Look in an encyclopedia for different sorts of weighing machines: balances, steelyards, spring scales. Report to the class on what you find.

3. Change 12 lb. 3 oz. to oz.

4. Change 84 oz. to lb. and oz.

5. How many pounds in $2\frac{1}{4}$ tons?

6. How many grains in an avoirdupois ounce?

7. How many grains in a troy ounce?

8. Add each quantity in Row B to every quantity in Row A. Leave answers in simplest form.

Row A	5 lb. 12 oz.	8 lb. 10 oz.	11 lb. 13 oz.
Row B	2 lb. 13 oz.	4 lb. 4 oz.	1 lb. 15 oz.

9. Subtract each quantity in Row B from each quantity in Row A.

Using Measures in Problems

1. Mrs. Hart bought four remnants of goods, with lengths: 2 yd. 14 in.; 3 yd. 10 in.; 2 yd. 8 in.; 4 yd. 10 in. What is the total length of all the pieces?

2. Mrs. Gray was serving a half pint of ice cream to each of 12 at a party How many quarts of ice cream should she buy?

3. If a can of pineapple weighs 1 lb. 13 oz., what is the weight of 24 cans?

4. Last year Joan weighed 72 lb. 10 oz. Now she weighs exactly 85 lb. How much has she gained?

5. Mrs. Brown weighed what potatoes she had, and found she had 6 pounds 6 ounces. She wanted them to do for 4 meals. If she divided them equally, how much did she have for each meal?

6. Mary has five assignments to prepare in 3 hours. If she divides her time equally, how many minutes can she give to each?

7. How many pieces of ribbon each 10 inches long can be cut from $3\frac{1}{3}$ yards?

8. A 5-gallon can of lemonade is divided equally among 8 thermos jugs. How many pints are put into each jug?

9. Robert dug 1 bushel 3 pecks of potatoes from one row. He has 12 rows in all. How many bushels of potatoes can he expect to have?

Measures That Are Gone

There has always been need for measures of length, of weight, and of value. Men have chosen as units measures that are natural and convenient. Our foot is a natural unit, and its length is convenient for measuring things that men need to measure. A bushel is approximately equal to a cubic foot, and a bushel of wheat was a man's load to carry. So it was with the common units of the past, and so it is today.

A **hand** is the distance across the palm of the hand. We think of a hand today as 4 inches.

A **span** is the distance from the tip of the little finger to the tip of the thumb of an outstretched hand. For a man, this is about 9 inches.

The **cubit,** used by many ancient peoples, is the length from the elbow to the tip of the middle finger. Its length varied from place to place and time to time. The cubit was used in England as 18 inches.

The **fathom** is the length from the tip of the finger on the right hand to the tip of the finger on the left hand when the arms are outstretched. We consider a fathom as 6 feet.

1. The sounding line showed that the water was 40 fathoms deep. How many feet is this?

2. Solomon's temple was 60 cubits long and 20 cubits wide. Find the dimensions in feet. How did it compare in size with your schoolroom?

3. Mr. Hartley says that his bay horse is $16\frac{1}{2}$ hands high. How many inches is that?

4. Among the ancients, the **talent** was a unit of weight. It was the weight of the water that filled a cube that was $\frac{2}{3}$ cubit on a side. About how many inches long was a side of this cube?

5. A cubic foot of water weighs about 62.5 pounds. About how many pounds in a talent? How does this compare with the weight of a bushel of wheat?

6. The **shekel** was a unit of value and a unit of weight for weighing precious metals. A shekel of gold weighed 130 grains, and in ancient times was worth about $5. The legal value of gold now is about 7.3 cents per grain. What would be the value of a shekel of gold now?

7. The spinners of 200 years ago measured wool by the **tod** (28 pounds), and the **sack** (13 tods). If the spinner worked 7 days a week and spun a pound of wool a day, how long would a tod last? How long would a sack last? Do you see why these units were convenient when spinning was done by hand?

Men have taken great care to keep their units of measure unchanged and to keep them from being lost or destroyed. Measures have been chiseled on monuments, marked on metal bars, and kept in the safest places men could find. In spite of all this care, the measures of olden times have been lost or destroyed or their values altered.

The Metric System

Our common units of measure grew without planning. After certain units were in use for a long time, the most useful of a kind, such as inches, feet, and yards, were related into systems.

A century and a half ago, the French decided to build a planned system of measures. They wanted a system of units that could never be changed, lost, or destroyed. They decided to base their unit, not on the length of the king's foot or the length of a man's arm, which lengths are subject to continual change, but upon a measurement of the earth itself. They sought to find the exact distance from the equator to the north pole. This distance, they said, would never change. They took 1/10,000,000 of this distance as their basic unit of length. They called this length a **meter.**

The units of measure that just grew without planning are related one to another by such numbers as, 3 (ft.), $5\frac{1}{2}$ (yd.), 12 (in.), and $16\frac{1}{2}$ (ft.). *The French decided to have a system in which the units were related one to another by tens, just as our number system is.* They based the longer units on the meter in this way.

Metric Measures of Length

1 meter (39.37 in.) =	1 meter
10 meters = 1 dekameter	**Deka** means 10.
100 meters = 1 hectometer	**Hecto** means 100.
1000 meters = 1 kilometer	**Kilo** means 1000.

The metric units measuring less than a meter are also related by tens.

1 meter (39.37 in.) =	1 meter	
.1 meter =	1 decimeter	**Deci** means .1.
.01 meter =	1 centimeter	**Centi** means .01.
.001 meter =	1 millimeter	**Milli** means .001.

The metric units of capacity and weight are based on the meter. For measuring liquids the two most common are the **cubic centimeter** and the **liter.**

A cubic centimeter is a cube measuring a centimeter, or a little more than $\frac{3}{8}$ in. on each side.

A liter is a cube measuring a decimeter, or about 3.937 in. on a side.

The most common metric units of weight are the **gram,** equal to the weight of one cubic centimeter of water, and the **kilogram,** equal to 1000 grams.

1. Which metric unit is closest to our yard?

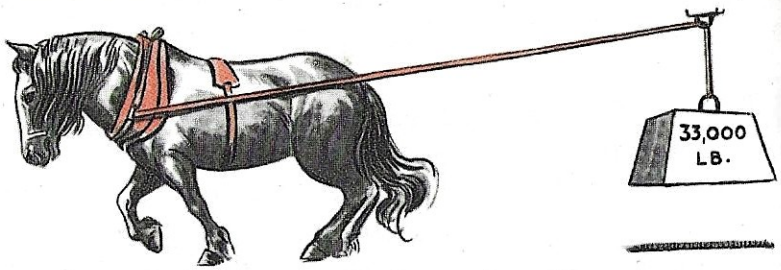
2. Which metric unit is closest to our mile? Is it longer or shorter than a mile?

3. How many inches long is a decimeter? A centimeter? A millimeter?

4. Tell how scientists, engineers, mechanics, and dentists might use the millimeter.

5. Some picture film is 35 millimeters wide. About how many inches is this?

6. A bottle of acid contains 1000 cubic centimeters. What is another name for 1000 cubic centimeters?



Units for Measuring Power

The most common unit for measuring work is the **horsepower.** *A horsepower is the work done in lifting 33,000 lb. one foot in one minute.*

1. An elevator lifts a load of 660 pounds 50 feet in 1 minute. This requires one horsepower, for $50 \times 660 = 33{,}000$.

2. Jack carries a load of 66 pounds up 20 feet of steps in 1 minute. What part of a horsepower of work did he use?

3. Estimate the load you can lift and the rate, and then find your estimated horsepower.

4. What is the horsepower of the engine in an automobile? In a large airplane?

5. Grand Coulee dam can produce 2,475,000 horsepower. How many tons could this amount of power lift one foot in one minute?

Electricity may be used to lift loads, to turn wheels, to produce heat, or to make light. The unit for measuring electricity is called a **watt.** A horsepower is equal to 746 watts, and a **kilowatt** is equal to 1000 watts. An electric current of one kilowatt for an hour is called a **kilowatt hour (K.W.H.).**

6. A 40-watt light bulb will use 1 K.W.H. of electricity in 25 hours, for $25 \times 40 = 1000$. In how many hours will a 50-watt light bulb use 1 K.W.H. of electricity?

7. If electricity costs 6¢ per K.W.H., find the cost of using a 50-watt bulb for 4 hours; two 40-watt bulbs for 4 hours.

8. An electric toaster uses 600 watts. If electricity is $7\frac{1}{2}$¢ per K.W.H., what is the cost of using the toaster for 30 minutes?

9. An electric iron uses 750 watts. If electricity is 8¢ per K.W.H., how much does it cost to use the iron for 3 hours?

The unit used in measuring heat is called a **calorie.** The exact value of a calorie is given in metric units. For our purpose here, a calorie is equal to the amount of heat needed to raise the temperature of 1 quart of water $1\frac{3}{4}°$ Fahrenheit.

10. Faucet water has a temperature of 72°. It will take 80 calories to raise one quart of faucet water to the boiling point (212°).

$$212° - 72° = 140°$$

$$140° \div 1\frac{3}{4}° = \overset{20}{\cancel{140}} \times \frac{4}{\cancel{7}} = 80$$

11. How many calories will it take to raise a quart of faucet water to 100°?

12. How many calories will it take to raise the temperature of a quart of water from 50° to 120°?

13. How many calories will it take to raise the temperature of 10 gal. of water from 65° to 100°?

Measuring Food Fuel

The human body can be thought of as an engine, and food as the fuel that makes the engine go.

The table below gives the approximate number of calories needed each hour by a grown-up for each pound the person weighs.

Sleeping	.4	Moderate work	2.0
Sitting quietly	.6	Heavy work	3.0
Light work	1.0	Very heavy work	4.0

1. A farmer weighs 180 pounds. He sleeps 8 hours, sits quietly 3 hours, does moderately hard work 10 hours, and light work 3 hours. How many calories does he need in the 24 hours?

2. A woman weighs 130 pounds. She sleeps 9 hours, sits quietly 4 hours, does light work for 11 hours. How many calories does she need in the 24 hours?

The table below gives the approximate number of calories per day needed by young people for each pound of weight.

Age in Years	1	2	4	8	12	16	20
Calories	45	42	38	32	28	24	20

3. Sam is 12 years old and weighs 93 pounds. About how many calories does he need each 24 hours?

4. Grace is 8 years old and weighs 68 pounds. How many calories does she need per day?

5. Try to find how many calories per pound of weight are needed by a boy 10 years old.

Scientists have found the food value to be different for different kinds of food.

6. Steak is about $\frac{1}{4}$ protein. A pound of protein will produce about 1818 calories. How many calories are there in the protein of a pound of steak?

7. Steak is about $\frac{1}{10}$ fat. A pound of fat will produce about 4090 calories. How many calories are there in the fat of a pound of steak?

8. Sugar is pure carbohydrate, and a pound of carbohydrate contains 1818 calories. How many calories are there in $\frac{1}{4}$ pound of pure sugar candy?

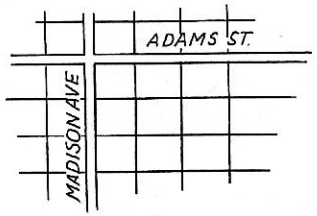
9. Butter is 85% fat. A pound of butter is cut into 64 servings. How many calories are there in a serving of butter?

10. A health authority says that growing girls should eat for breakfast enough to make $\frac{1}{4}$ the calories needed daily. Helen is 12 years old and weighs 88 pounds. How many calories should she have for breakfast?

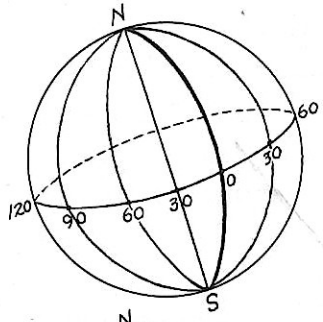
11. Would you consider this a satisfactory breakfast for Helen: one slice white bread (50 calories), half pint of milk (150 calories), one large egg (100 calories), three large prunes (100 calories), four slices of crisp bacon (100 calories), and a banana (100 calories)?

12. For lunch, Helen should have about $\frac{1}{3}$ of her daily requirement. How many calories is this?

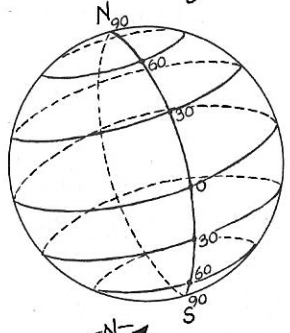
Where Am I and What Time Is It?



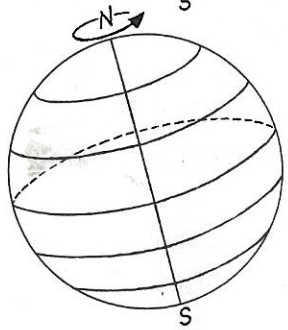
I say I am on Adams Street, but that is not enough. Adams Street extends a long way in each direction. I say I am at the point where Adams Street crosses Madison Street. That is enough to tell where I am. The crossing of two lines locates a point exactly.



Sailors at sea and persons on land can locate any point on the earth as the crossing point of two lines.



Think of the earth's equator as divided into 360°. Think of a curved line going from pole to pole and through each of these points of division. Each of these lines is a **meridian of longitude.** The meridian that goes through the point marked 0°, called the **prime meridian,** passes through Greenwich in England. The other meridians are numbered to the right and left of the prime meridian.



Think of the prime meridian as divided into 360°. Think of

a circle, parallel to the equator, drawn through each of these points of division. Each of these circles is a **parallel of latitude.**

A meridian of longitude and a parallel of latitude locate a point exactly, just as the crossing of any two lines locates a point. One who has the instruments and knows how to use them can find the latitude and longitude of any point.

The table below gives the hour at different longitudes when it is 12 o'clock noon at Greenwich. The letter E after a number of degrees tells that it is east longitude from Greenwich, and the letter W tells that it is west longitude.

Longitude	15°W	30°E	75°W	60°E
Hour	11 A.M.	2 P.M.	7 A.M.	4 P.M.

When it is 12 o'clock noon at Greenwich, tell the time at each of these longitudes.

1. 15°E 45°E 75°E 90°E 120°E 150°E

2. 30°W 90°W 45°W 60°W 120°W 105°W

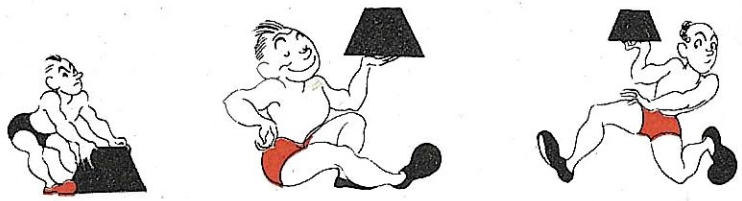
3. When it is 12 o'clock noon on Tuesday at Greenwich, what hour and what day is it at 180°E longitude? At 180°W longitude?

4. Use a globe to see that 180°E longitude and 180°W longitude are the same line. What is this line called? Tell something about this line.

5. A ship at 45°N and 30°W radios for help. Show on a map or globe about where the ship is.

6. What large city in the United States has the latitude and longitude: 41°N and 74°W?

7. What large city in another country has the latitude and longitude: 31°N and 121°E?



Developing Power in Problem Solving

No pencils, please!

The following table shows the number of calories produced by certain foods.

Food	Size of Portion	Calories per Portion
Milk	6 oz.	120
Egg	2 oz.	75
Beef	$\frac{1}{4}$ lb.	360
Pork	$\frac{1}{4}$ lb.	400
Bread	2 oz.	160
Cereals	1 oz.	80
Fresh fruits	$\frac{1}{4}$ lb.	60

1. How many calories are in a beef steak weighing $\frac{1}{2}$ lb.?

2. Eggs of a certain grade average about 2 oz. each. How many calories are in $\frac{1}{2}$ doz. such eggs?

3. How many calories are in a 10-oz. glass of milk?

4. How many more calories are in a pound of pork than in a pound of beef?

5. A cup contains 8 fluid ounces. Tom drank 2 cups of milk. How many calories did that amount of milk contain?

6. How many calories are in a 12-oz. box of breakfast cereal?

Use pencils to find answers.

7. Mrs. Brown made a meat loaf using the following ingredients.

1 egg
1 cup of bread crumbs (2 oz.)
2 tablespoons of milk (1 oz.)
1 lb. of beef
$\frac{1}{4}$ lb. of pork

If there are 5 persons in her family, how many calories will each get if he eats his exact share of the meat loaf?

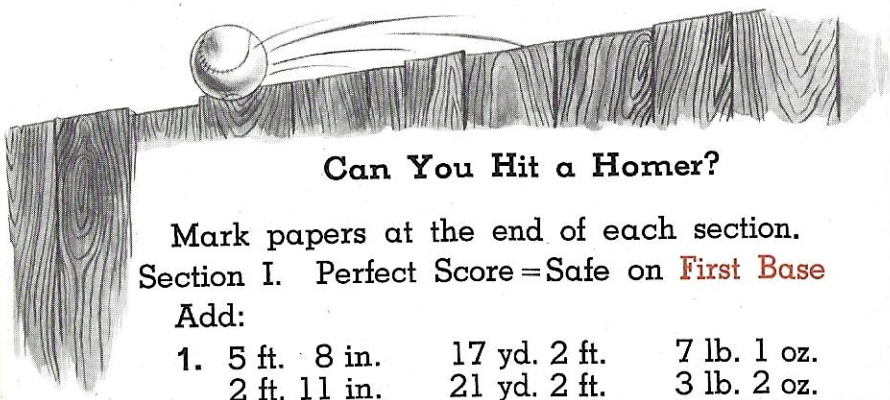
8. A loaf of bread weighing 15 oz. contains how many calories?

9. A loaf of bread weighing 15 oz. is cut into 16 slices. How many calories will there be in each slice of this bread?

10. Jane's mother figures that Jane ought to get about 1320 calories a day from her food. If she gives Jane enough food for breakfast to provide her with $\frac{1}{4}$ of the calories she needs for the day, how many calories should she get from her remaining two meals?

11. Harry weighs 107 lb. and is 16 years old. If he needs about 24 calories per day for each pound of weight, how many calories should his food provide him daily?

12. Ann made two sandwiches, using $\frac{1}{8}$ lb. of cold beef roast and 4 slices of bread (1 oz. to the slice). How many calories did the two sandwiches contain?



Can You Hit a Homer?

Mark papers at the end of each section.

Section I. Perfect Score = Safe on First Base

Add:

1.

5 ft. 8 in.	17 yd. 2 ft.	7 lb. 1 oz.
2 ft. 11 in.	21 yd. 2 ft.	3 lb. 2 oz.

2.

4 ft. 7 in.	23 yd. 1 ft.	5 lb. 11 oz.
6 ft. 9 in.	2 yd. 2 ft.	4 lb. 15 oz.
9 ft. 10 in.	42 yd. 2 ft.	8 lb. 10 oz.

Section II. Perfect Score = Safe on Second

Subtract:

3.

5 yd. 1 ft.	2 sq. ft. 4 sq. in.
2 yd. 2 ft.	1 sq. ft. 101 sq. in.

4.

6 mi. 450 ft.	10 cu. yd. 5 cu. ft.
2 mi. 900 ft.	4 cu. yd. 11 cu. ft.

Section III. Perfect Score = Safe on Third

Multiply:

5.

9 lb. 3 oz.	4 hr. 25 min.	8 yd. 2 ft.
× 3	× 2	× 12

6.

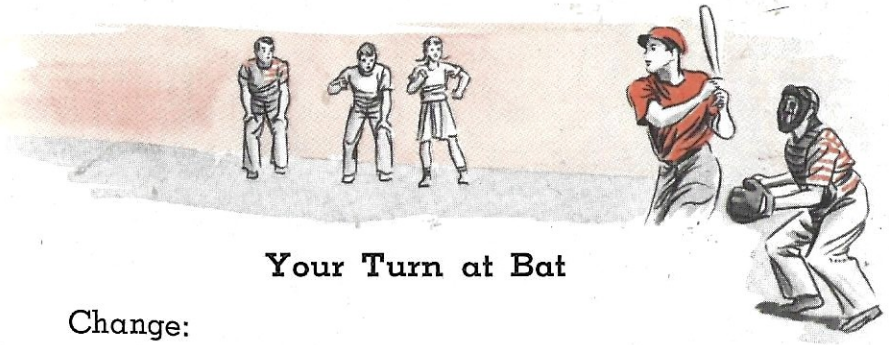
4 bu. 3 pk.	15 gal. 3 qt.	6 ft. 9 in.
× 8	× 7	× 5

Section IV. Perfect Score = Safe at Home

Divide:

7. $3\overline{)18 \text{ lb. } 15 \text{ oz.}}$ $5\overline{)11 \text{ yd. } 2 \text{ ft.}}$ $3\overline{)20 \text{ hr. } 15 \text{ min.}}$

8. $3\overline{)10 \text{ qt. } 1 \text{ pt.}}$ $2\overline{)5 \text{ bu. } 2 \text{ pk.}}$ $4\overline{)9 \text{ yd. } 4 \text{ in.}}$



Your Turn at Bat

Change:

1. 17 ft. to yd. and ft. 70 in. to ft. and in.

2. 75 oz. to lb. and oz. 14 qt. to gal. and qt.

3. 17 pt. to qt. and pt. 18 pk. to bu. and pk.

Add:

4.

9 yd. 2 ft. 7 in.	4 gal. 3 qt. 1 pt.
2 yd. 2 ft. 3 in.	2 gal. 2 qt.
1 yd. 1 ft. 8 in.	4 gal. 3 qt. 1 pt.

Subtract:

5.

17 lb. 9 oz.	11 lb. 2 oz.	8 bu. 1 pk.
8 lb. 6 oz.	6 lb. 9 oz.	4 bu. 2 pk.

Multiply:

6.

2 sq. ft. 96 sq. in.	5 mi. 200 rd.
× 8	× 6

Divide:

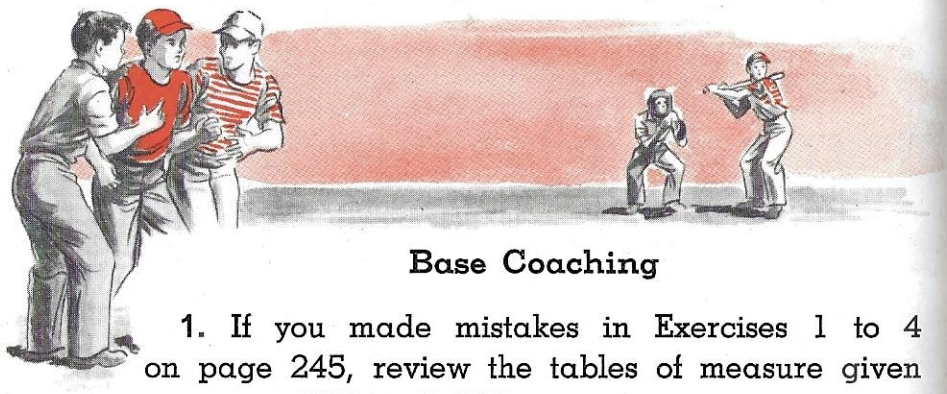
7. $3\overline{)9 \text{ ft. } 6 \text{ in.}}$ $6\overline{)20 \text{ lb. } 4 \text{ oz.}}$

Supply the missing numbers:

8. A horsepower is the work done in lifting ___ lb. through ___ ft. in ___ min.

9. A calorie is the amount of heat needed to raise the temperature of 1 qt. of water by ___°.

Work on page 246 if you made more than 4 mistakes. Others will work on page 247.



Base Coaching

1. If you made mistakes in Exercises 1 to 4 on page 245, review the tables of measure given on pages 223 and 228.

Find a partner to work with you. Work Exercises 11 to 15 on page 225. Check papers for each other.

Work Exercise 8 on page 230. Check.

2. If you made mistakes in Exercises 5 to 8, work page 244 with your partner.

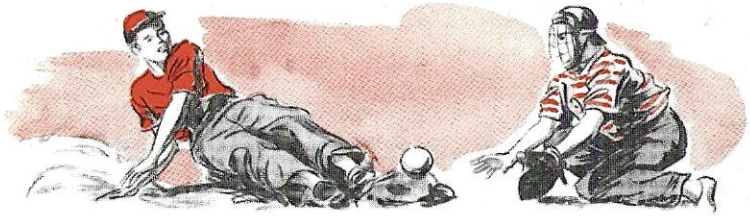
3. A horsepower is a unit used for measuring work. *A horsepower is the work done in lifting 33,000 lb. a distance of one foot in one minute.* How many pounds could a $\frac{1}{4}$-horsepower motor lift one foot in one minute?

4. How many horsepower of electricity will it take to lift 99,000 lb. one foot in one minute?

5. Study page 237, Exercises 10 to 13, if you do not understand the meaning of a calorie.

6. Draw a line one meter long on the blackboard. If you do not have a meter stick, draw a line 36 in. long and add about $3\frac{1}{3}$ in. to it. Will this be very close to a meter (39.37 in.)?

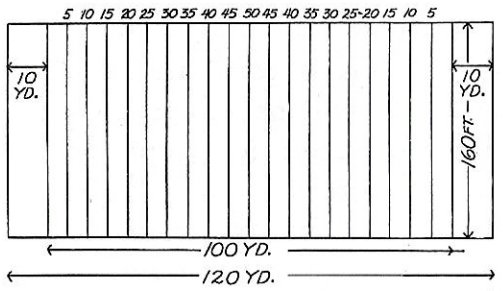
7. A piece of velvet 5 meters long is how many inches longer than a piece 5 yards long?



Stealing Bases

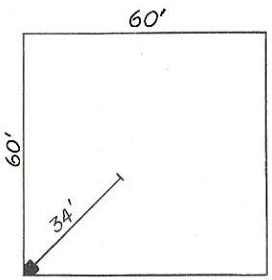
Each figure below gives the shape and the dimensions of a field or court used in athletics. Choose a suitable scale and make the drawing on the blackboard. Work in four groups, each group drawing a different court or field.

1.



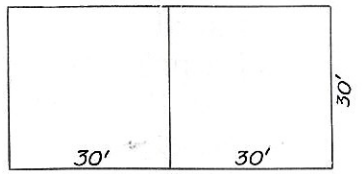
FOOTBALL FIELD

2.



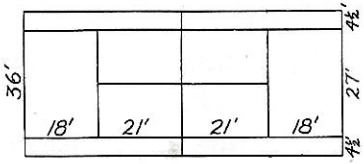
SOFTBALL DIAMOND

3.

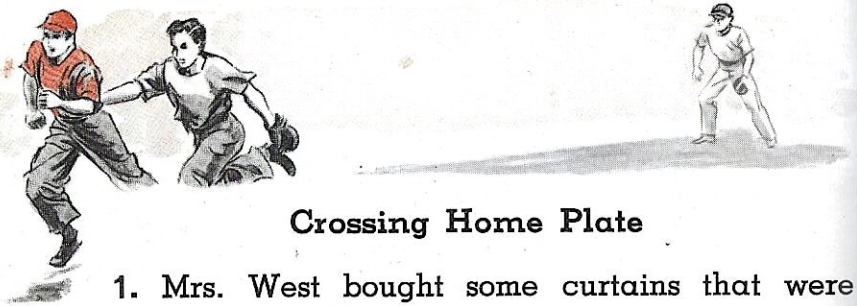


VOLLEYBALL COURT

4.



TENNIS COURT



Crossing Home Plate

1. Mrs. West bought some curtains that were each 81 in. long. If she cut 1 ft. 3 in. from the length of each curtain, what did each curtain then measure? If she used 5 in. from each of the shortened curtains to make a hem, what was the length of each hemmed curtain? Draw a picture to prove your answer.

2. Mr. West raised 78 bu. of tomatoes. He put these in $\frac{1}{2}$ pk. baskets and sold them at the roadside. How many $\frac{1}{2}$ pk. baskets did he fill?

3. Mrs. West made 3 gallons of grape juice and put it away for the winter in $\frac{3}{4}$ pt. bottles. How many bottles were there?

4. Mr. West built a house for 250 chickens that was 20 ft. wide and 50 ft. long. How many square feet of floor space was this per chicken?

5. Tom West delivers newspapers. He can carry 25 lb. of papers in his bag. How many papers does he carry when his bag is full, if each daily paper weighs an average of 5 oz.?

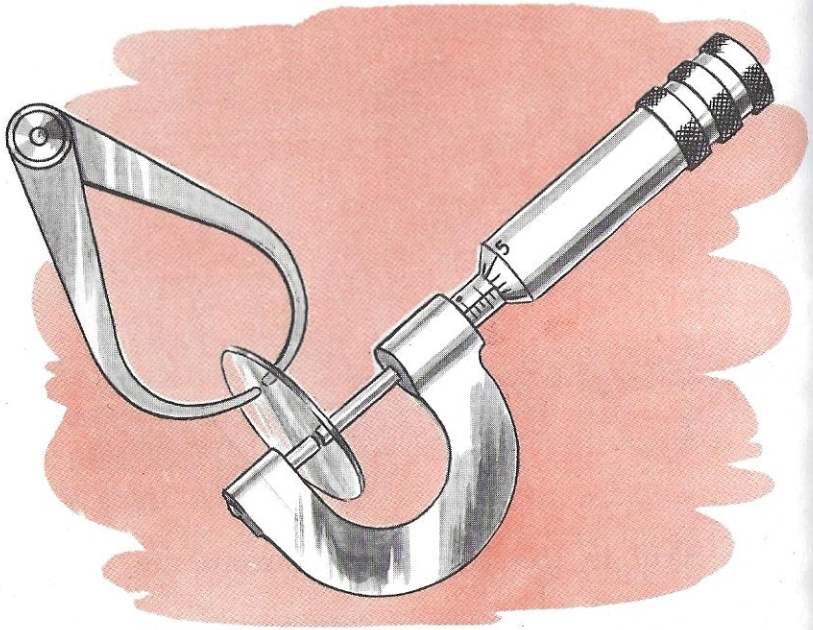
6. Tom picked 7 bu. 2 pk. of apples. How many $\frac{1}{2}$ bu. baskets could he fill?

7. Ann West gathered the eggs. If she got 10 doz. 5 eggs Monday and 9 doz. 4 eggs Tuesday, how many dozen was this?

Skill in the Use of Measurements

The druggist who compounds your prescription must be accurate in his use of measures. Surveyors of land must have skill in making another kind of measures. Cooks, clerks, builders, and scientists are continually using systems of measures. In fact, so many uses are made of measures daily that it is wise to get all the knowledge and practice you can in this field.

No matter how carefully a measure is made, there is always some slight variation. Explain why this is true. Because there can be a variation, no matter how slight, standards of all measuring instruments used in the United States are kept in Washington, D. C., by the National Bureau of Weights and Measures.



Instruments Used in Linear Measure

The instruments we use most to measure lines are the ruler, the yardstick, and the tapeline. A speedometer, such as is used on a bicycle or an automobile, automatically measures the distance traveled.

Besides these instruments which are so familiar, there are other tools useful in measuring lengths and thicknesses. **Calipers** are used for measuring thicknesses which are not easily checked with a ruler or yardstick. A **micrometer** is used to measure very small lines or thicknesses, accurate to about .0001 of an inch.

Estimating Linear Measures

Sometimes it is useful to be able to estimate lengths and thicknesses.

1. Draw a line which you think is 2 in. long. Measure the line with your ruler. How much did you miss the correct length?

2. Draw lines of the following lengths without measuring. Then measure and find how nearly correct you were.

5 in. $3\frac{1}{2}$ in. 9 in. 7 in. $1\frac{1}{2}$ in. 4 in.

3. Estimate the length of the teacher's desk. Measure the length and find your error.

4. Estimate the width of the opening of the door. Measure it and compare with your estimate.

5. Length and width are **dimensions.** Estimate the dimensions of your classroom. Measure the dimensions and compare with your estimate.

6. How many feet are there in a rod? Mark off a distance along the wall which you think is about equal to one rod. Measure your estimate. How much more or less than a rod was your estimate?

7. What is your height in inches? Express your height in feet.

8. Explain how you could measure the length of a block in a city without using such a small instrument as the yardstick.

9. If a city block is about 352 ft. long on an average, how many such blocks will make a mile?

Perimeter

The perimeter of a square or rectangle is the distance around it, or the sum of the four sides. The perimeter of your classroom, then, consists of two lengths and two widths. This gives the formula—

Perimeter = 2 widths + 2 lengths or $p = 2w + 2l$

1. What would you do to find $2w$? (Really $2w$ means $2 \times w$.) What would you do to find $2l$?

2. Find the perimeter of a rectangle that is 4 ft. wide and 6 ft. long.

Write the formula for perimeter: $p = 2w + 2l$

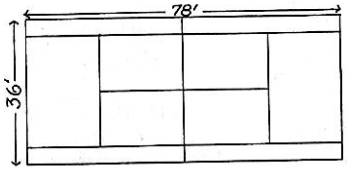
Write the numbers used in the problem in place of the letters used in the formula. $p = 2 \times 4 + 2 \times 6$

In such a statement as $p = 2 \times 4 + 2 \times 6$ *multiplication must be done before addition.* $p = 8 + 12$

The perimeter is then found by adding. $p = 20$

3. Find the perimeter of a field that is 14 rd. long and 115 rd. wide.

4. Use the formula for perimeter to find the distance around the tennis court shown below.



5. Find the perimeter of the top of a box which is 3 ft. in length and 1 ft. 6 in. in width. (Change all measurements to inches or reduce 6 in. to a fractional part of a foot.)

6. If Mary wanted to put a ruffle around the box described in Exercise 5, how much goods would she use if she gathered it so full that it took twice the perimeter?

7. If the perimeter of a square is 16 in., how long is one side? Hint: The four sides of a square are equal.

8. Find the perimeter of the playground at school if it is 400 ft. wide and 580 ft. deep.

9. What is the perimeter of a lot 225 ft. by 180 ft.? Change the perimeter to yards.

10. How much quarter-round finishing is needed for a room 18 ft. long and 12 ft. wide?

11. Mrs. Jones wanted to make a border of stones around her flower bed. The stones averaged 12 in. across. How many stones would be needed for the bed if it was 12 ft. long and 4 ft. wide? Add four extra stones to the perimeter to close the four corners. Draw a picture to prove your answer.

12. What is the perimeter of a badminton court in yards, if the measurements are 12 ft. in width and 36 ft. in length?

13. How many feet of wire will it take to go around a poultry yard 30′ 6″ by 21′ 10″?

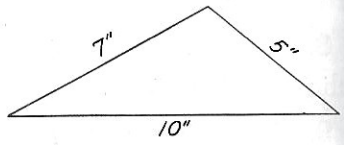
Perimeter of Squares and Triangles

1. What is the length of each side of a 9 in. square? What will be its perimeter? Draw a picture to prove your answer.

2. Explain: *the perimeter of a square* = **4s.**

3. The distance around a baseball diamond is 360 ft. If a baseball diamond is the shape of a square, how far does a player run in going from one base to another?

4. How many sides has a triangle? How would you find the perimeter of the triangle shown at the right?



5. Tom made a triangular flower bed with all sides equal in length. He put a wire fence around it using posts and two strands of wire. How many feet of wire did he use if one side of the bed measured 4 ft.?

6. Find the perimeter of a triangle with sides measuring 3 ft. 2 in., 5 ft. 9 in., and 2 ft. 4 in.

Find the perimeter of the following squares. The letter **s** stands for **side.**

7. $s = 1\frac{3}{4}$ ft. **8.** $s = 45$ ft. 6 in.

9. $s = 2$ yd. 2 ft. **10.** $s = 5$ yd. 11 in.

11. $s = 4$ rd. 10 ft. **12.** $s = 12$ rd. 3 yd.

13. If the distance around a triangle having three equal sides is 11 ft. 3 in., how long is one side? Draw a picture to prove your answer.

Learning the Order of Processes

In a numerical statement containing two or more processes, all multiplications and divisions must be done first.

Addition and subtraction are then carried out in the order found in the statement.

Example: $12 \times 2 - 18 \div 3 = ?$

Explain: $24 - 6 = 18$

Find the value of each of the following.

1. $9 \times 7 - 3 = ?$ $14 \div 2 + 9 = ?$

2. $15 \div 5 - 3 = ?$ $11 - 3 \times 3 = ?$

3. $8 \div 2 + 3 \times 4 = ?$ $25 \times 3 - 5 \times 10 = ?$

4. $5 \times 9 + 8 \div 4 = ?$ $125 \div 5 - 15 = ?$

On page 252 you learned that the formula for finding the perimeter of a rectangle is $p = 2w + 2l$. This may be written $p = 2(w + l)$. When you use the latter, you think: length added to width is half way around the rectangle. To find the entire distance this sum must be multiplied by 2. *The parenthesis around* (w+l) *tells you that you must add first and then multiply by the* **2** *outside the parenthesis.*

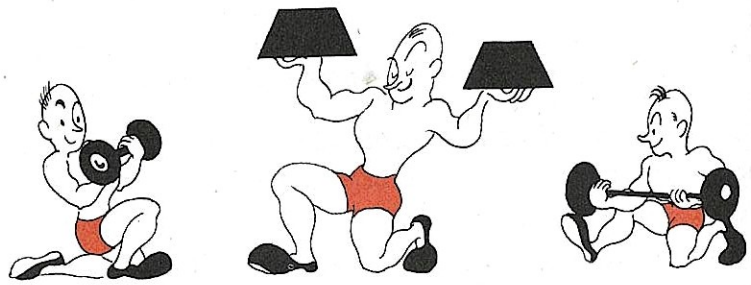
In a numerical statement the process inside parenthesis must be done first. Then follow the order given at the top of this page.

Find the value of the following.

5. $5(6+4) =$ $8(7-5) =$ $(8+4) \div 3 =$

6. $2(8+2) =$ $5(8-2) =$ $(9-5) \div 2 =$

7. $2(6+4) \times (9-3) =$ $9 \times 27 + 5 =$



Developing Power in Problem Solving

Formulas are a great help in problem solving.

Each letter in the formula, $a=b\times c$, stands for a number. When any two of the numbers are given, you can use this formula to find the third.

1. When $b=8$ and $c=5$, what is a?

2. When $a=42$ and $b=6$, what is c?

3. When $a=56$ and $c=7$, what is b?

4. What process do you use to find the third number when a and b are given? When a and c are given? When b and c are given?

5. Show that the formula $a=b\times c$ may be written as $b=\frac{a}{c}$, or as $c=\frac{a}{b}$.

6. Let A stand for the area of a rectangle, l for its length, and w for its width. Find A when $l=13$ and $w=6$.

7. Write a formula using A, l, and w.

8. Use the formula (Prob. 7) to find A when $l=12$ and $w=4$.

9. Find l when $A=63$ and $w=7$.

10. Find w when $A=72$ and $l=6$.

11. Let D stand for the distance traveled, r for the rate of travel, and t for the time. Write a formula using D, r, and t.

12. Find t when $D=160$ mi. and $r=32$ mi. per hr.

13. Find r when $D=180$ mi. and $t=6$ hr.

14. Let n stand for the number of jars each weighing w pounds, and let W be the total weight of all the jars. Write a formula using W, n, and w.

15. Find W when $n=240$ and $w=\frac{1}{2}$ lb.

16. Find w when $n=160$ and $W=120$ lb.

17. Find n when $w=.32$ lb. and $W=25.28$ lb.

18. Find w when $W=17.28$ lb. and $n=18$.

19. Let N be the number of eggs in a case, B the number that are broken, and P the part that are broken. Find B when N is 72 and P is $\frac{1}{2}$.

20. Write a formula using N, B, and P.

21. Find B when $N=120$ and $P=.3$.

22. Find P when $N=36$ and $B=18$.

23. Find P when $N=56$ and $B=24$.

24. Find N when $B=16$ and $P=.8$.

25. Find N when $B=32$ and $P=\frac{1}{4}$.

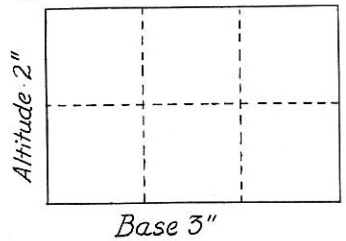
26. Let T be the total number of children at a picnic, G be the number of them who are girls, and P the part of the group who are girls. Write a formula using T, G, and P.

27. If three fourths of those at the picnic are girls and there are 12 girls, how many are there in all?

28. If there are 32 children at the picnic and 20 of them are girls, what part of them are girls?

Area of Rectangles

The area of anything includes the surface enclosed by the perimeter. The surface of the table top is its area. Area is measured in square units.



1. Draw a rectangle 3 in. long and 2 in. wide. Draw lines 1 in. apart across the length and width. How many blocks does this make? Measure the blocks to see if they are one inch on each side. Each one is a square inch.

2. Multiply the length of the rectangle by the width. How does the product compare with the number of square inches that you counted above?

In multiplying linear units of the same denomination together, you get square units of that denomination. Explain.

3. The length and width of a rectangle are sometimes called the base and altitude. *The side at the bottom is called the* **base.** *The adjoining side is called the* **altitude.**

4. The formula for finding the area of a rectangle is usually written with the dimensions called the base and altitude.

Area of a rectangle = base X altitude, or
Area of rectangle = b X a.

5. Could you use this formula in finding the area of a square? Explain.

Problems About Areas of Rectangles

1. Find the area of a rectangle having a base of 6 in. and an altitude of 4 in.

$A = b \times a$ $A = 6$ in. $\times$ 4 in. $A = 24$ sq. in.

2. How would you find the base of the rectangle described in Exercise 1 if you knew the area and the altitude? Write this as a formula.

Find the missing measurement.

3. Area = 40 sq. in.; base = 5 in.; altitude = ?

4. Base = 9 in.; altitude = 11 in.; area = ?

5. Altitude = 12 in.; area = 36 sq. in.; base = ?

6. Base = 3 ft.; altitude = 20 ft.; area = ?

7. If a rug measures 9'x12', how many sq. yd. of carpet does it contain? Explain work below.

$\frac{9 \times 12}{9} = 12$ sq. yd.

8. How many square yards of land are needed to make a tennis court 78' by 36'?

9. A sheet of paper 12" by 9" contains how many square feet?

10. How many square feet are there in your classroom floor? How many are in the ceiling?

11. How many square yards of carpet will be used in covering a hall 28' by 9'?

Find the areas for these rectangles.

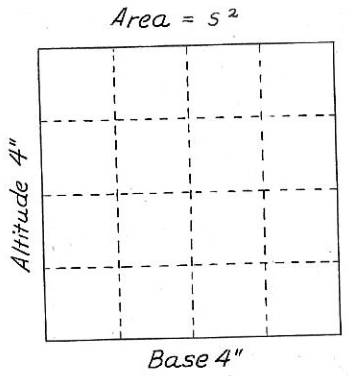
12. Length 10 ft.; width 5 ft. 6 in.

13. Length $8\frac{1}{2}$ ft.; width $4\frac{3}{4}$ ft.

14. Length 2 ft. 9 in.; width 1 ft.

15. Length $8\frac{1}{2}$ in.; width 6 in.

Square Numbers



The base and altitude (or the length and width) of a square are the same size, and so the area of a square is one side multiplied by itself. If a square is 4 in. on a side, the area is 4×4, or 16 sq. in.

When a number is multiplied by itself, a small ^{2} *is written to the right at the top of the number, like this,* 4^2. That means 4×4, and is read **4 squared.** The formula for the area of a square can be written $s \times s$ (side $\times$ side), or s^2. It is read, **s squared.**

1. Read the following aloud. Then give the value of each.

6^2 10^2 9^2 100^2 20^2 8^2 1^2

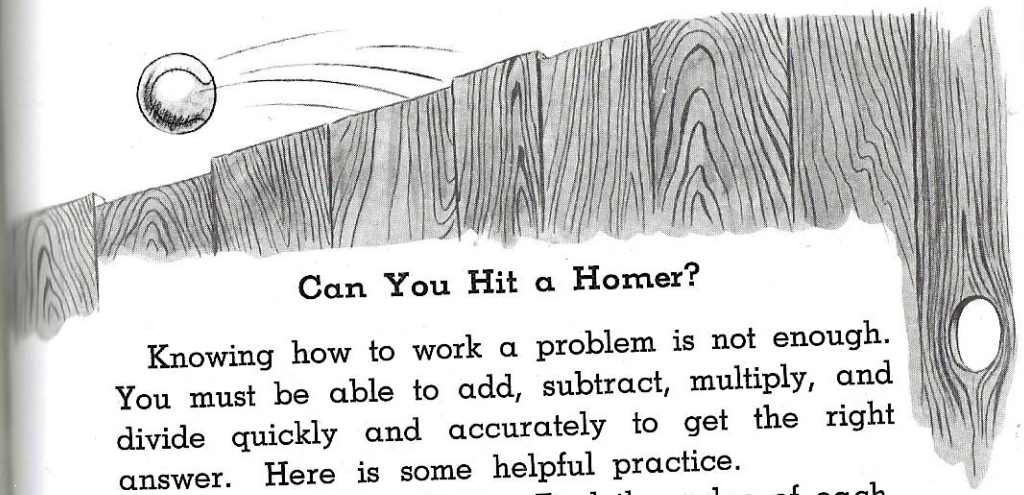
2. How many square feet are in a grass plot measuring 12 ft. on each side? How many square yards does this square contain?

Find the area of squares with sides of the following measurements.

3. $s = 3$ in. $s = 5\frac{1}{2}$ ft. $s = 1$ ft. 3 in.

4. $s = 7\frac{3}{4}$ ft. $s = 4\frac{1}{3}$ yd. $s = 9$ rd.

5. A square floor measuring 8 ft. on a side is covered with tiles that are 1-in. squares. How many tiles did it take to cover this floor?



Can You Hit a Homer?

Knowing how to work a problem is not enough. You must be able to add, subtract, multiply, and divide quickly and accurately to get the right answer. Here is some helpful practice.

Section One. First Base. Find the value of each.

1. $12+3\times4$ 9^2-20 $2(4+5)$ $3\times5-12\div3$

2. $8\times9-2$ $36+2^2$ $5(8-3)$ $8\times9-2\times3$

3. $75-50\div2$ $2\times3+8^2$ $4(9\div3)$ $2\times42+7\times3$

Section Two. Second Base

4-7. Work Exercises 9-12 on page 332.

Section Three. Third Base

8-12. Work Exercises 11-15 on page 335.

Section Four. Home Run

13-18. Work Exercises 14-18 on page 336.

Special Practice

19. Page 339, Exercise 28.

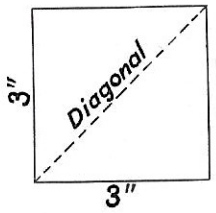
20-22. Page 339, Exercises 15-17.

Find the value of each of the following when $a=2$, $b=6$, $c=9$, $r=8$, $d=12$, $x=15$, $w=10$

23. a^2 d^2 x^2 $\frac{r}{2}$ $2(w+x)$ $\frac{d\times c}{2}$

24. $\frac{d}{3}$ b^2 $\frac{x}{4}$ r^2 $3(r^2-d)$ $d^2\times\frac{r}{4}$

Areas of Triangles



1. Cut a 3-in. square from paper. What is its area?

2. Draw a diagonal across the square. *The* **diagonal** *of a square cuts it into two equal triangles.* Prove this by cutting your square on the diagonal and matching the two triangles.

3. If the two triangles are equal, and together they make a 3-in. square, how many square inches are there in the area of each triangle?

4. The dimensions of a triangle are the **base** and **altitude.** The base is the bottom line; the altitude is the perpendicular drawn from the point where the two sides meet above the base (vertex of the triangle) to the base line. See Figure A.

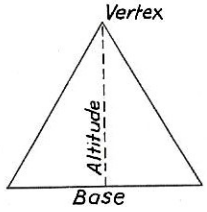


Figure A

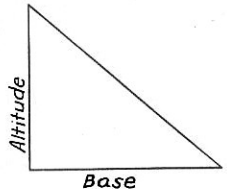


Figure B

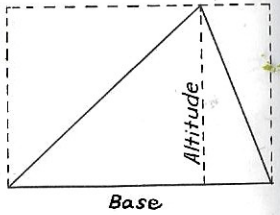
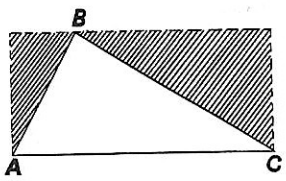


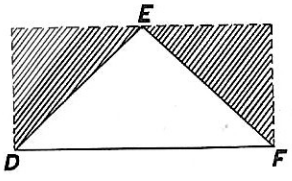
Figure C

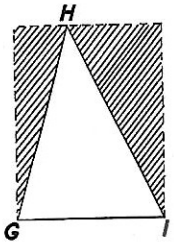
5. In a right triangle the altitude is the side perpendicular to the base line. See Figure B.

6. Any triangle can be made into a rectangle of the same base and altitude by drawing a line parallel to the base through the vertex, and two lines perpendicular from this line to the ends of the base line. See Figure C.

7. Draw several triangles and make them into rectangles as explained in Exercise 6. Shade the parts of the rectangle around the original triangle. Cut up each rectangle and compare the area of the shaded parts with the original triangle. How do they compare? What part of the whole rectangle is the triangle?







8. The formula for the area of a rectangle is $A = b \times a$. Since a triangle is $\frac{1}{2}$ a rectangle having the same base and altitude, the formula for the area of a triangle is $A = \frac{b \times a}{2}$.

Find the area of these triangles.

9. $b = 12$ in.; $a = 6$ in. $b = 8$ in.; $a = 10$ in.

10. $b = 8\frac{1}{2}$ in.; $a = 7$ in. $b = 3$ ft.; $a = 4$ ft.

11. $b = 9$ in.; $a = 6$ in. $b = 10$ in.; $a = 3\frac{1}{2}$ in.

Arrange the formula to find the base when the area and altitude are given. Find the bases of these triangles.

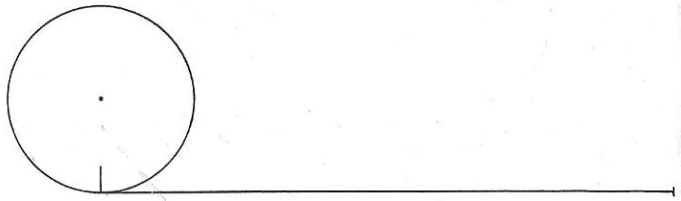
12. Area, 12 sq. in.; altitude, 3 in.

13. Area, 21 sq. in.; altitude, 7 in.

Arrange the formula to find the altitude when the area and base are given. Make some examples and use this formula.

Comparing Circumference and Diameter

Cut a circle from heavy paper. Different pupils should cut circles of various diameters, such as 3 in., 4 in., and 5 in.



1. Make a mark on the circumference and push your pencil point through the center of your circle. Beginning at the mark, roll the circle like a wheel along a straight line until you come to the mark a second time. Measure exactly the distance your circle traveled along the line, and you will know the circumference of your circle.

2. Divide the circumference of your circle by the diameter, using decimals. That is, if the circumference measures $17\frac{1}{8}''$, write 17.125″.

3. Put on the blackboard quotients found by different pupils. If work was done carefully, all the quotients will be very close to 3.14, or about $3\frac{1}{7}$ times. This value, or ratio, is called **pi.** **Pi** is a Greek letter and is written π. The formula for the fact you learned on this page is written:

$c \div d = \pi$ (*circumference ÷ diameter = π*).

4. Explain these formulas:

$c = d \times \pi$ $\qquad$ $d = c \div \pi$

When carried to four decimal places, pi equals 3.1416. For our use $3\frac{1}{7}$ ($\frac{22}{7}$) or 3.14 will be accurate enough.

5. Find the circumference of a circle whose diameter is 12 in. Formula: $d \times \pi = c$

Using fractions

$12 \times 3\frac{1}{7} =$

$12 \times \frac{22}{7} = \frac{264}{7} = 37\frac{5}{7}$ in.

Using decimals

12 in.
× 3.14 or

3.14
12
628
314
37.68 in.

6. Find the circumference of these circles.

$d = 21$ in. $\quad d = 49$ ft. $\quad d = 56$ yd. $\quad d = 3\frac{3}{4}$ ft.
$d = 140$ rd. $\quad d = 2\frac{1}{3}$ mi. $\quad r = 15$ in. $\quad r = 126$ ft.

7. What is the diameter of a circle having a circumference of 242 in.? Formula: $c \div \pi = d$

Using fractions

$242 \div 3\frac{1}{7} =$

$\overset{11}{\cancel{242}} \times \frac{7}{\cancel{22}} = 77$ in.

Using decimals

77 + in.
3.14)242.00
2198
2220
2198
22

8. Find the diameters of these circles.

$c = 88$ in. $\quad c = 220$ yd. $\quad c = 121$ ft. $\quad c = 440$ in.
$c = 187$ yd. $\quad c = 132$ rd. $\quad c = 4\frac{2}{5}$ mi. $\quad c = 2\frac{1}{5}$ mi.

Finding the Area of a Circle

Tom wanted to concrete the bottom of a circular fish pond. He did not know the formula for finding the area of a circle, and he could not tell how many square yards the bottom of the pool contained. He worked until he found a formula for the area of a circle. Do the work he did and learn the formula.

Cut a circle having a 3-in. radius. Fold it four times through the center, dividing it into 8 equal parts. Cut it along the folds. Cut one of the parts into halves along the radius. Arrange the parts as shown in Figure 2.

Figure 1

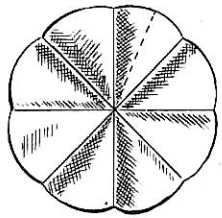


Figure 2

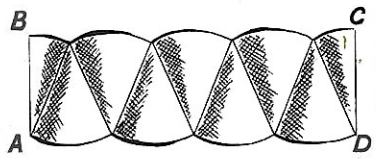


Figure 2, or the figure *ABCD*, is like a rectangle. What dimension of the circle is the altitude *AB*? What part of the circumference of the circle is the base *AD*?

The formula for the area of a rectangle is base $\times$ altitude. Use the dimensions of the circle and the area of *ABCD* is $\frac{1}{2}c \times r$. Since the area of the rectangle is the same as the area of the circle, the formula for the area of the circle is $\frac{1}{2}c \times r$.

The formula $\frac{1}{2}c \times r$ can be written in a simpler form. Think:

$$c = \pi \times d \qquad \frac{1}{2}c = \frac{\pi \times \overset{r}{\cancel{d}}}{\cancel{2}} = \pi \times r$$

Put $\pi \times r$ in place of $\frac{1}{2}c$, and the formula will be $\pi \times r \times r$, or πr^2.

The area of a circle $= \pi\ r^2$.

1. If the fish pond Tom is making has a radius of 3 yd., how many square yards of concrete will it take to cover it?

Formula *Work*

$\text{Area} = \pi\ r^2$ $\qquad \pi = 3\frac{1}{7} = \frac{22}{7}$

$$\frac{22}{7} \times 3 \times 3 = \frac{198}{7} = 28\frac{2}{7} \text{ sq. yd.}$$

2. How many square yards of concrete would it take if the radius was 7 yd.?

Find the areas of these circles.

3. $r = 14$ in. $\quad r = 21$ ft. $\quad r = 4$ in. $\quad r = 35$ ft.

4. $d = 20$ in. $\quad d = 14$ ft. $\quad d = 8$ yd. $\quad d = 2$ ft.

5. Find the circumferences of the circles in Exercises 3 and 4 above.

Find the diameters of these circles.

6. $c = 44$ in. $\quad c = 11$ in. $\quad c = 33$ in. $\quad c = 77$ in.

7. How many square yards of sod will it take to cover a circular grass plot having a diameter of 42 ft.?

8. How many square feet are there in the bottom of a circular swimming pool having a 63-ft. radius? Change to square yards.

Review

1. What is 5^2?

2. What is meant by the Greek letter π?

3. How can you write 6 to show that it is to be multiplied by 6?

4. How do you find the radius when the diameter is given?

5. Find the area of a circle whose radius is 4 ft.

6. Over what area can a horse graze if he is tied to a post with a rope 10 ft. long?

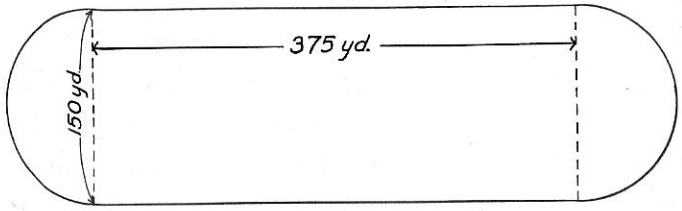
7. What is the area of a circle enclosed in a square whose side is 6 inches? Draw the figure.

8. What is the area of the square in problem 7? How much larger is the square than the circle?

9. Find the area of the circle when

a. radius is 5 ft.
b. diameter is 6 ft.
c. radius is 2 yd.
d. radius is 100 ft.

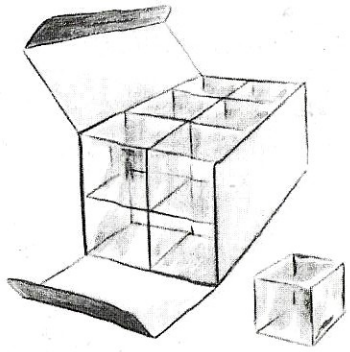
10. Find the area enclosed by the race track as illustrated here.



The ends of the race track are perfect semicircles.

The rest of the space makes a rectangle.

Cubes and Rectangular Solids



1. Mrs. Allen had so many guests that she needed an extra supply of ice cubes. She bought some at the drug store in boxes. How many cubes were in a box if they were packed as shown in the picture?

2. If an ice cube measures an inch on each side, what is the **volume,** or **cubic contents,** of one ice cube?

3. Why is this piece of ice called an ice "cube"?

4. What are the dimensions of the ice cube?

5. What are the dimensions of the box in which the ice cubes are packed? How can you tell?

An object having three dimensions, length, width, and thickness, is called a **solid.**

Solids having six rectangular faces, or sides, are called **rectangular solids.**

Which of the following are rectangular solids: a brick, a piece of loaf sugar, a can of sirup, a brick of ice cream?

The formula for finding the volume of a rectangular solid is $volume = l \times w \times h$.

Before multiplying, be sure the dimensions of the solid are of the same denomination.

Review the table of cubic measure (p. 228).

Finding Volumes of Rectangular Solids

1. A block of marble 3 ft. long, 10 in. wide, and 9 in. thick contains how many cubic inches? Cubic feet? Cubic yards?

Explain: $3 \times 12 \times 10 \times 9 = 3240$ *cu. in.*

Explain: $3 \times \frac{\cancel{10}^{5}}{\cancel{12}_{4}} \times \frac{\cancel{9}^{3}}{\cancel{12}_{4}} = \frac{15}{8} = 1\frac{7}{8}$ *cu. ft.*

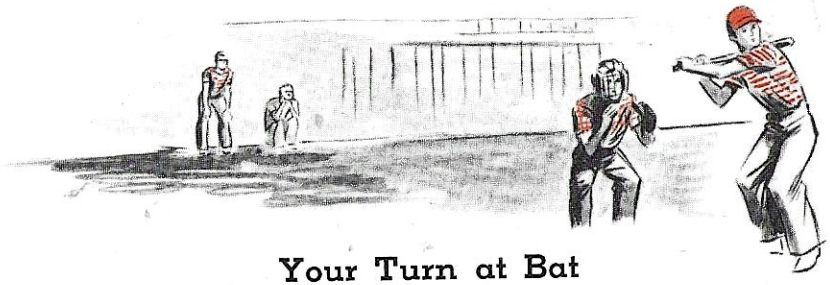
Explain: $\frac{\cancel{3}}{\cancel{3}} \times \frac{\cancel{10}^{5}}{\cancel{36}_{18}} \times \frac{\cancel{9}}{\cancel{36}_{4}} = \frac{5}{72}$ *cu. yd.*

2. If the block of marble measured 6′x18″x9″, how many cubic inches would it contain? Cubic feet? Cubic yards?

Find the volume of the following in cubic inches; in cubic feet.

	length	width	height
3.	5 in.	14 in.	21 in.
4.	3 ft.	5 ft.	9 ft.
5.	$2\frac{1}{2}$ ft.	3 ft.	$\frac{1}{2}$ ft.
6.	4 ft. 6 in.	6 in.	1 ft. 3 in.
7.	18 ft.	9 in.	15 in.

8. How many gallons does a tank 2 ft. long, 11 in. wide, and 14 in. high contain?



Your Turn at Bat

1. Complete and explain the following formulas, as $2l+2w=$? means 2 lengths + 2 widths = the perimeter of a rectangle.

$b \times a =$? $\quad s^2 =$? $\quad c \div \pi =$? $\quad 2r =$?

$l \times w \times h =$? $\quad \frac{b \times a}{2} =$? $\quad d \times \pi =$? $\quad \pi r^2 =$?

Write the formula for each of the following problems and solve.

2. How many bricks in a stack 20 bricks long, 4 bricks wide, and 15 bricks high?

3. How many gallons will a tank 6′ x 2′ x $1\frac{1}{3}$′ hold, counting $7\frac{1}{2}$ gal. to a cubic foot?

4. The radius of a circle is 7 ft. What is the diameter? The circumference?

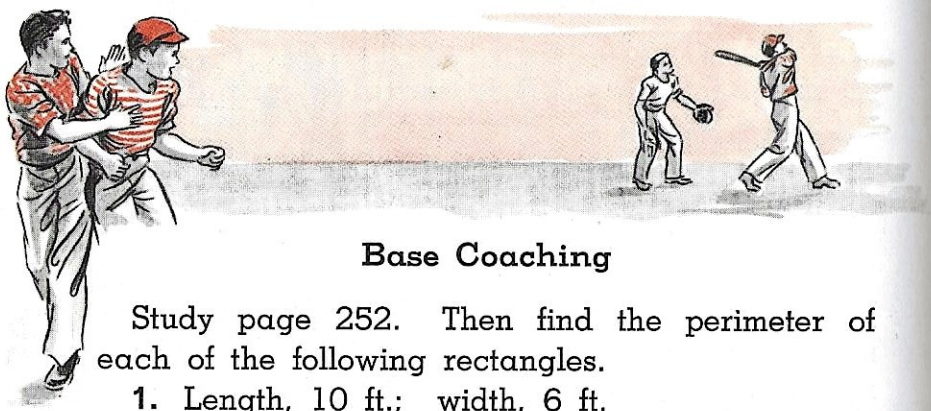
5. Find the area of a circular garden having a radius of 14 ft.

6. How many feet of fence will it take to enclose a poultry yard 50′ x 30′?

7. What is the area of a triangular sail having a base of 9 ft. and an altitude of 17 ft.?

8. How many square yards of linoleum will it take to cover a room 12 ft. x 18 ft.?

If you made any mistakes above, work page 272. Others may work page 273.



Base Coaching

Study page 252. Then find the perimeter of each of the following rectangles.

1. Length, 10 ft.; width, 6 ft.

2. Length, 7 in.; width, 4 in.

3. Length, 2 ft. 6 in.; width, 1 ft. 3 in.

4. Length, 2 yd.; width, 2 ft.

Study page 258. Then find the area of the rectangles in Exercises 1–4 above.

Study pages 262 and 263. Then find the area of the following triangles.

5. Base, 4 in.; altitude, 3 in.

6. Base, 2 ft.; altitude, 1 ft. 6 in.

7. Base 10 in.; altitude, 7 in.

8. Base 1 ft. 3 in.; altitude, 9 in.

Study pages 264 and 265. Find the diameter and circumference of each of the following:

9. Radius, 14 in. **10.** Radius, $3\frac{1}{2}$ yd.

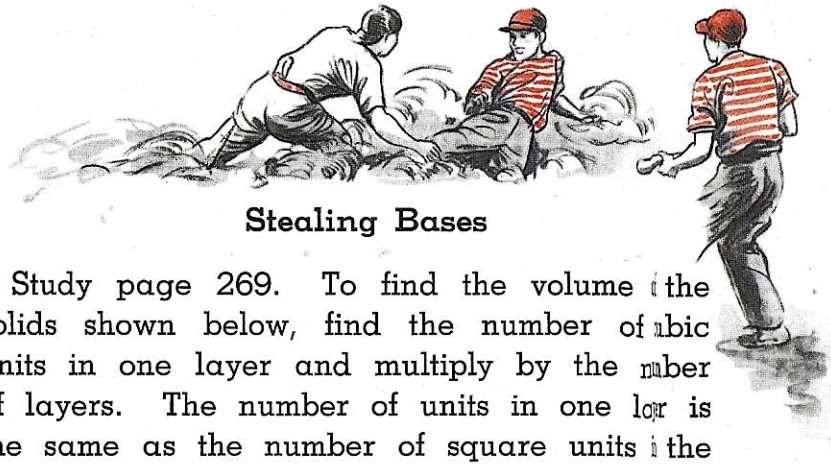
11. Radius, 21 in. **12.** Radius, $5\frac{1}{2}$ ft.

Study pages 266 and 267. Then find the area of the circles in exercises 9–12.

Study pages 269 and 270. Then find the volume of the following rectangular solids.

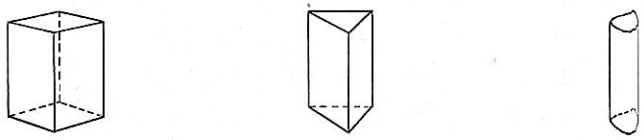
13. $4\frac{1}{2}'' \times 5'' \times 2\frac{1}{2}''$ **14.** $5' \times 12' \times 2''$

15. $2'2'' \times 28'3'' \times 7'$ **16.** $9'' \times 3'6'' \times 9'$



Stealing Bases

Study page 269. To find the volume of the solids shown below, find the number of cubic units in one layer and multiply by the number of layers. The number of units in one layer is the same as the number of square units in the area of the base.



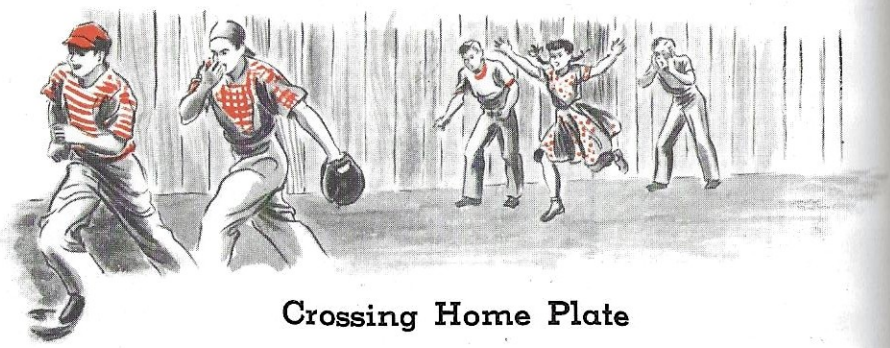
Rectangular solid Prism Circular cylinder

1. The base of a prism is a triangle whose altitude is 5 in. and whose base is 4 in. The height of the prism is 12 in. What is its volume? Hint: Find area of base $\times$ height.

2. A cylindrical tank has a circular base with an area of 9 sq. ft. If the tank is 14 ft. high, how many cubic feet does it contain?

3. A water tank has a circular base with a radius of 7 ft. How many square feet does the base contain? How many cubic feet are there in the tank if it is 15 ft. high?

4. A triangular prism is 12 ft. high. The base has an altitude of 4 ft. perpendicular to a 5 ft. side. What is the area of the base? What is the volume of the prism?



Crossing Home Plate

1. What is the perimeter of a storeroom 5 ft. wide and 18 ft. long? What is the area of the floor? How many cubic feet of storage space does it contain if it is 8 ft. high?

2. The wheel of a motorcycle is 30 in. in diameter. What is its circumference?

3. A circular parking lot has a diameter of 120 ft. What is the radius? How many square feet does the lot contain?

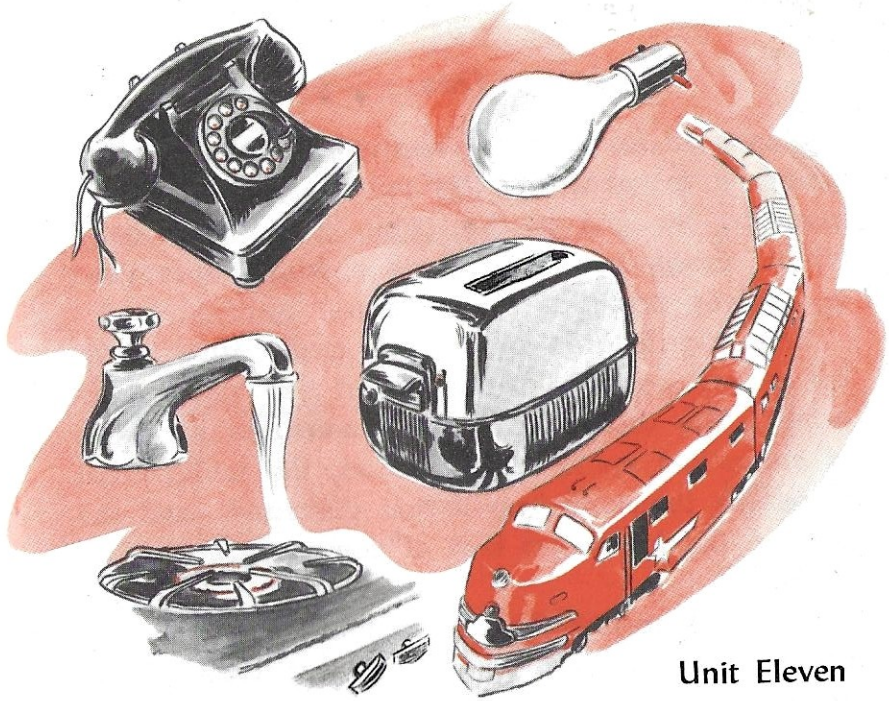
4. How far would you walk if you went around the outer edge of the lot described in problem 3?

5. A triangular billboard is 10 feet high and measures 12 feet along its base. How many square feet of surface does it contain?

6. A rectangular tank measures 14′ x 7′ x 11″. How many gallons of water will the tank contain when full? Use 231 cu. in. = 1 gal.

7. The diameter of the earth is about 8000 mi. Find the distance around the earth and write in round numbers to the nearest thousand.

8. A farmer has a bin measuring 20′ x 8′ x 4′. How many bushels of wheat can be put in the bin if one bushel will take $1\frac{1}{4}$ cu. ft.?



Public Utilities

Telephones, electric light and power, gas, water, and the great systems of railroads are used by the public and are known as **public utilities.** Because every family in the United States uses one or more of these services, it is important to learn something about figuring the cost of these services to you.

Try to bring to class a telephone, electric, gas or water bill for study. If it is a receipted bill, be sure to take it home again and keep it as a record that the bill has been paid. If the bill is unpaid, take it home before payment is due.

Gas

Gas used for cooking, heating, and such home purposes is measured by volume. The unit of measure for gas is the cubic foot. The meter which shows how much gas a family has used in a given time has three dials.

The middle dial on the gas meter runs counter-clockwise, while the other two run clockwise. The dial on the right measures hundreds of cubic feet up to one thousand; the middle dial measures thousands up to ten thousand; and the dial on the left shows tens of thousands up to 100 thousand.

On some meters there is a fourth dial measuring millions of cubic feet, but this type is less common.

The reading from a meter is not made from the number nearest the hand, but from the smaller of the two numbers between which the hand is registering. The dials shown above read 2 - 4 - 2 hundred cubic feet. The charge is made on the hundred cubic feet.

Figuring a Gas Bill

Each month the gas company has the meter read. The amount of gas used during a given month is found by subtracting the reading of the previous month from the present reading.

1. From the readings below find the amount of gas used during the month.

Reading on Jan. 4

Reading on Feb. 4

2. At the rate of $1.20 per thousand feet, find the cost of the gas used during the month given in problem 1.

3. If the company gives a 5% discount for paying the bill before the twenty-sixth of the month, what will the net amount be for the gas used in problem 1?

4. Explain the following form. What is the rate of discount?

Nashville Gas Company

Mr. J. R. Hill — BILL DUE 2–18–48

1792 17th Ave. So. — LAST DAY NET 2–26–48

Reading Dates		Meter Readings		Class	Hundred Cu. Ft. Used	Amount of Bill	
Previous	This Mo.	Present	Previous			Gross	Net
14	14	2688	2665	00M3	023	3.16	2.93

Problems about Gas Bills

1. Does your community use natural or artificial gas? What is the difference? Which should have the cheaper rate? Why?

2. What is the rate charged for gas in your town? What discount is allowed for prompt payment of bills?

3. What is the cost of using 4200 cu. ft. of gas if the rate is $1.35 per thousand cubic feet?

4. Mr. Jackson's gas bill for the month was $4.74 gross or $4.31 net. If he paid the bill before the date of discount, he had to pay the net amount. If he delayed and paid the bill after the date of discount, he had to pay the gross amount. What per cent did he save by paying before the date of discount?

5. At the rate of $1.28 per thousand and a discount of 5% for prompt payment, what net amount will Mr. Clem pay for the use of 5800 cu. ft. of gas?

6. Read the gas meter at home on five successive days. Find the average amount of gas used by your family daily.

Find the net bill for the following.

7. 3800 cu. ft.; $1.25 per 1000; 5% disc.
8. 2550 cu. ft.; $1.35 per 1000; 3% disc.
9. 4500 cu. ft.; $1.20 per 1000; 5% disc.
10. 7500 cu. ft.; $.95 per 1000; 5% disc.

Electricity

Electricity supplies the fuel for your electric stove, toaster, fan, or lights. This electric power, or energy, can be measured as accurately as gas, water, or any other substance. It is necessary to measure electricity to find how much you must pay the electrical company for the amount of this energy, or fuel, that you use.

The unit for measuring electric current is called the **watt.** Light bulbs and electrical appliances are marked to show the number of watts of current they use, or consume. A bulb marked "100W" uses 100 watts. A toaster marked "600W" uses 600 watts. A kilowatt is 1,000 watts, or 10 times 100 watts. The rate charged for the use of electricity is based on the kilowatt hour, that is, the company charges by the 1000 watts used for one hour. If you burn ten 100W bulbs for one hour, you would use $10 \times 100W$, or 1000W for one hour. This would equal one kilowatt hour (K.W.H.).

1. How many kilowatt hours of current would ten 100W bulbs burn if lighted for 4 hours?

2. How many kilowatt hours of current would twenty 150W bulbs use in one hour? In five?

3. How many kilowatt hours will forty 75W bulbs consume if allowed to burn 6 hours?

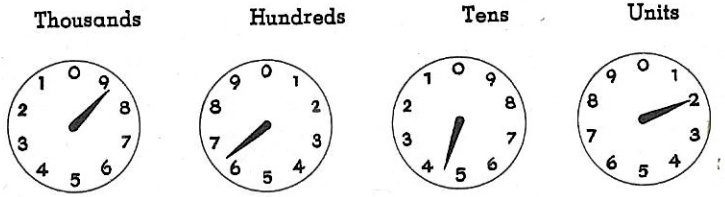
4. Tom forgot and left a 75W light burning for 12 hours. How much current did he waste?

Finding Amount of Electricity Used

An electric meter is used to measure the amount of current used. There are usually four dials with hands showing the amount of current that has passed through the meter since it was started.

On two dials the hands turn clockwise, and on the other two, counterclockwise. When the hand is between two numbers, read the smaller, except on the right hand dial, where the number nearer the hand is read. The dials record kilowatt hours.

1. Read this meter.



Kilowatt Hours

2. Draw four dials and show 479 K.W.H.

3. Study the following bill. How did the company find the number of K.W.H. used that month?

Atlas Power & Light Company
Little Rock, Arkansas

THIS BILL IS DUE NOW
Prompt Payment will be Appreciated

Mr. W.R. Coyle
1795 S. Harrison
Jan. 26, 1948

Meter Readings			Consumption	Class	Amount Due
Date	Previous	Present	KWH		
2 1	4 79	5 22	43		3 05

Finding the Cost of Electricity

1. Last month an electric meter read 255 K.W.H. This month the reading is 302 K.W.H. How many K.W.H. have been used this month?

2. Electric companies usually charge more for the first 30, 40, or 50 K.W.H. and less as the number of kilowatt hours used increases. Why?

3. What will a customer pay for 65 K.W.H. if the company charges 6¢ per K.W.H. for the first 50 K.W.H. used, and 5¢ each for the next 50 K.W.H.?

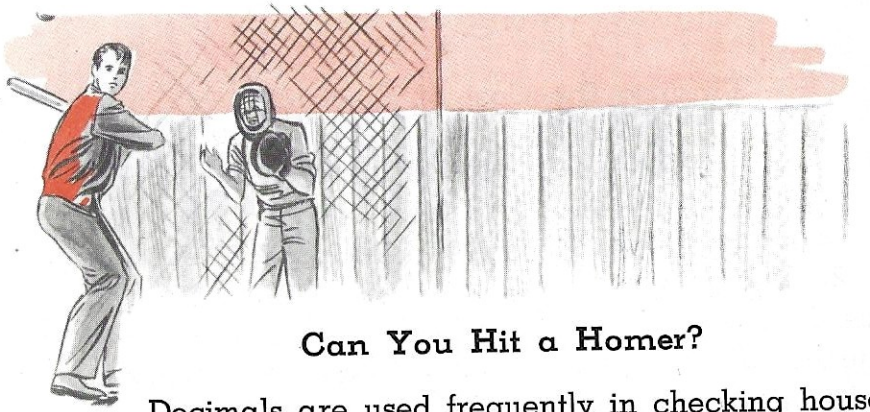
A small town in Tennessee pays the following rates for current:

First	30 K.W.H. @ 8¢
Next	50 K.W.H. @ 4¢
Next	100 K.W.H. @ 3¢
All above	180 K.W.H. @ 2¢

4. Compute the electric bill at the rates above for these meter readings:

Meter	Present Reading	Previous Reading
A	98	42
B	1079	1004
C	2567	2453
D	1588	1360
E	7823	7474

5. Many companies have a minimum amount that any bill may be for one month. How much will Mrs. Smith pay for 15 K.W.H. if the minimum bill is $1.00 and the rate 5¢ each for the first 30 K.W.H.?



Can You Hit a Homer?

Decimals are used frequently in checking household bills such as heat, light, and water bills. It is important to know where to place a decimal point and always to place it there. This special practice is given to help you review decimals. If you fail to make a home run, work pages 338 and 339 for additional practice.

Section One. First Base

Write sums.

1.

6.7	8.0	7.34	84.6	9.00	76.3
3.2	7.3	8.13	9.5	.34	8.4
5.6	9.7	2.69	17.6	6.05	.8

Write remainders.

2.

8.4	9.2	7.00	8.30	9.07	17.3
4.3	3.4	2.60	.34	4.08	8.0

Section Two. Second Base

Multiply.

3.

6.3	7.8	9.2	8.46	91.3	7.37
5	.3	1.7	.34	4.7	.09

4.

.05	.95	4.3	1.20	2.50	500
.02	1.2	.52	.125	.075	.89

Section Three. Third Base

Divide.

5. $2\overline{).12}$ $.2\overline{)1.2}$ $.2\overline{)12}$ $.2\overline{).12}$

6. $3\overline{)1.44}$ $.7\overline{)10.5}$ $2\overline{).1}$ $.03\overline{)78}$

7. $3\overline{)49.2}$ $7\overline{)5.74}$ $.6\overline{)2.88}$ $.08\overline{)128}$

8. $29\overline{)13.92}$ $2.7\overline{)78.3}$ $.34\overline{)22.44}$ $.63\overline{)327.6}$

9. $.38\overline{)1900}$ $24\overline{).6}$ $24\overline{).576}$ $.29\overline{)87}$

Section Four. Home Run

10. Find the sum of 1.46, 3.20, 4.07, and 11.13.

11. Add $.04+5.32+560.01+39$.

12. Subtract 3.08 from 24.23.

13. Take \$.05 from \$9000.

14. Multiply $\$45.50 \times .125$.

15. Multiply $\$.75 \times 3.25$.

16. Divide .04375 by 1.25.

17. Divide 78.54 by 3.1416.

18. Round to the nearest thousand:
785,692; 1,862,319; 23,345,487.

19. Round to the nearest ten thousand:
76,843,262; 609,748,639.

20. Write in figures:
Three hundred fourteen thousand
Three hundred fourteen thousandths
Three hundred fourteen ten-thousandths
Twenty-one and thirty-two hundred-thousandths
Two hundred four and three ten-thousandths

Telephone Service

The telephone service is one of the public utilities which has served as an excellent means of communication. The charges are moderate for the conveniences a telephone offers. It is now possible for practically every family to have the use of a telephone.

Telephone rates vary for home and for business, for party and for private lines. The rates, however, are uniform within a city for each particular type of phone. Different cities may have different rates, but within a single city the rates are the same for any one kind of phone.

The long-distance telephone rates increase with distance and with the length of time of the call. A call made directly from one person to another person is more expensive than a call made from one station to another station.

What are the telephone rates in your town for a two-party line? What are the rates for a private line? How do the rates for a business differ from the rates for a home? What is the reason for this difference in cost?

1. A station-to-station rate between two cities is \$1.85 for a three-minute call. The person-to-person rate between the same two cities for the same time is \$2.70. What per cent saving is there on the station-to-station call?

In calling long distance on the telephone, **night rates** apply from 6 p.m. till 4:30 a.m. on week days and all day on Sunday. **Day rates** apply all other hours of the week.

Costs are usually quoted for 3-minute calls. The cost of each minute, after the first 3 min., is one-third the cost of the 3-minute call. A federal tax of 25% must be added to the cost quoted by the telephone company.

The costs (without federal tax) of calls between St. Louis and certain other cities are given in the table below.

	Station-to-Station		Person-to-Person	
	Day	Night	Day	Night
Atlanta	\$1.20	\$.80	\$1.70	\$1.30
Buffalo	1.50	1.10	2.10	1.70
Cincinnati	1.00	.65	1.40	1.05
Des Moines	.95	.60	1.35	1.00
Memphis	.85	.55	1.20	.90
New York	1.60	1.20	2.25	1.85
San Francisco	2.20	1.75	3.10	2.65
Tulsa	1.10	.75	1.55	1.20

2. Find the cost, including federal tax, of an 8-min. person-to-person call between St. Louis and Cincinnati at 3 p.m. on Friday.

3. Find the cost, including federal tax, of a 6-min. station-to-station call between St. Louis and San Francisco at 5 p.m. on Sunday.

4. Make up six problems from data given in the table above.

Water Supply

City water works supply water to their customers. In some cities a set amount is charged based on the number of hydrants and other outlets for using water. Many other cities use water meters. The water meter measures the amount of water used, and the cost is based on this amount.

At set times the meter reading is taken in cubic feet. After the reading of the previous bill is subtracted from the new reading, the result shows the number of cubic feet of water used. There are $7\frac{1}{2}$ gallons to a cubic foot so the number of cubic feet used is multiplied by $7\frac{1}{2}$ to find the number of gallons used. The rate is made for one thousand gallons.

1. How many gallons of water are there in 1790 cu. ft.? What would be the cost at 15¢ per 1000 gallons?

2. If during one quarter Mr. Haynes' family used 2257 cubic feet of water, what was the bill at 12¢ for 1000 gallons?

3. At 12¢ for 1000 gallons find the total cost for the year for water with the four quarters given:

First quarter	2090 cu. ft.
Second quarter	3123 cu. ft.
Third quarter	4204 cu. ft.
Fourth quarter	2970 cu. ft.

Review Problems

1. What are public utilities?

2. Who is a consumer?

3. Could you check the amount of electricity used during the month? How is the charge made for electrical energy?

4. Sketch the four dials of an electric meter reading 5-6-4-0 kilowatt hours. Which dials run counterclockwise?

5. What is a kilowatt hour? What does the prefix "kilo" mean?

6. What is the charge per K.W.H. if the cost of 70 K.W.H. is $2.80?

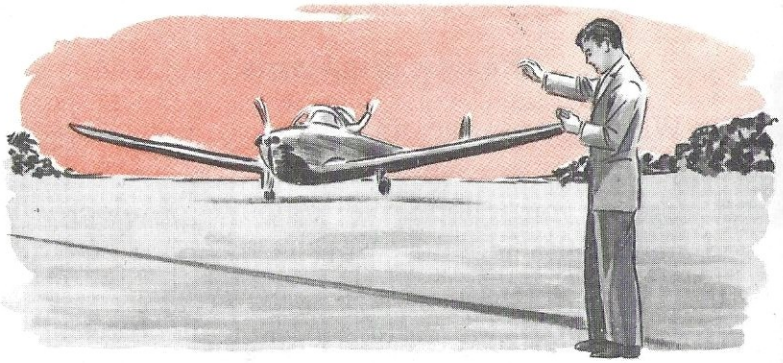
7. How is the charge made for the use of gas? How is gas measured?

8. Read the gas meter below:

At the end of the month the meter read 4-9-6. How much gas had been consumed during the month? What was the cost if the rate was $1.20 per thousand cubic feet?

9. Find the cost of 1860 cubic feet of water at 14¢ per 1000 gallons.

10. If a month's bill for water is $1.26 and the rate is 15¢ per 1000 gallons, how many cubic feet have been used?



Speed, Knowledge, and Accuracy

This student pilot is about to take off on a test flight. He will be judged by the length of time he takes to make his trip and how close he can stop to the line on which the starter is standing. In other words, he will strive for speed and accuracy, and if his knowledge of flying is very good, the trip should be a success.

Arithmetic also requires speed, accuracy, and knowledge. Test your speed and accuracy by racing and checking with a partner as you work exercises on pages 289–293.

Test your knowledge of some of the very important things in arithmetic by reviewing the following.

Measures and Their Uses

Arithmetic is a subject that teaches you to measure things. It helps you to answer such questions as how many, how much, how long, how big, and how valuable.

1. Make a list of all the units of measure that you know. Write the abbreviation of each.

2. Study the tables of measure on pages 323–324 and practice writing each table from memory.

3. What do you know about the following units of measure? Touchdowns; baskets; goals; fathoms; knots; calories; watts; meters.

4. Choose a partner. Ask each other facts from tables of measure. Study any facts missed.

Solving Problems

5. Sometimes the information you wish to find cannot be found by measuring or counting directly. It is often necessary that you take some related values and solve for the information you want. Suppose you are thinking of a train that travels an average of 65 miles per hour. You wish to know how far it can go in $7\frac{1}{2}$ hours. What steps do you follow in solving this problem?

When you begin to solve a problem ask yourself two questions:

What do I want to know?

What do I already know that will help me?

When you finish your problem ask:

Is my answer reasonable?

Is my work correct?

6. If a boy walks 7.2 mi. in 3.6 hr., how far can he walk in 1 hr.? Tom got 200 mi. for his answer. How could he have checked to discover his error?

Aviation

Regardless of the type of activity that interests you as work or recreation, you will find that it offers you many good mathematical problems. A group of boys became interested in aviation and found these problems.

1. Student flyers frequently try spot landing. Results of three boys' attempts are: Charles missed his mark 459′ 11″ on his first trial and 197′ 1″ on his second; Henry's record was 267′ 9″, and 243′ 10″; George's record was 339′ 2″ and 198′ 3″. Which boy had the best average in his two trials?

2. A student who was required to have 8 hr. of dual flying time (flying with an instructor in the plane) and 35 hr. of solo flying before being permitted to take an examination for a pilot's license has a total of 40 hr. 50 min. including solo and dual flying. How much more flying time does he need?

3. Fifty-seven paid for a ground course in flying. The fifteen who ranked highest were given additional free training. What per cent of the class was this?

4. Tom ranked fourth from the top in this same class. What per cent of the class ranked above him?

Transportation by Air Problems

1. One airline permits a maximum of 85 hours of piloting per month for each individual pilot. How does this compare with the total hours working time of a clerk who spends 8 hours a day for an average of 25 days per month in his store? Explain the difference.

2. If an airline permits 35 lb. of luggage for each passenger, what per cent of your luggage allowance would you be carrying if you took aboard a 2-lb. box of candy and a story book weighing 1.2 lb.?

3. Mr. Allen's bag weighed 7 lb. when empty. What per cent of his luggage allowance was this?

4. The total deck space in a 36-passenger plane is 792 sq. ft. How many square feet is this per passenger?

5. One company used 9,598,000 gal. of gasoline in one year. What would this cost at the price charged for the best gasoline sold in your town?

6. A new motor for a certain automobile cost $325. A motor for a Wright Cyclone engine costs $80,000. How many motors would that buy for the automobile?

7. A carburetor for a certain plane costs $325.00. If the carburetor for a given automobile costs $35.00, this is what per cent of the cost of the plane carburetor?

Athletics

1. Gilbert heard the junior high football coach say that he usually had a line (7 players) that weighed a thousand pounds. Gilbert weighed $139\frac{1}{2}$ pounds; how did he compare in weight with the average lineman?

2. After practice, one squad of eleven had lost weight as follows: $1\frac{1}{2}$ lb., $2\frac{1}{4}$ lb., 2 lb., 2 lb., $2\frac{1}{2}$ lb., $2\frac{1}{4}$ lb., $1\frac{1}{4}$ lb., 3 lb., $2\frac{1}{2}$ lb., $1\frac{1}{2}$ lb., $2\frac{1}{2}$ lb. What was the total weight worked off by the whole team?

3. What was the average amount of weight worked off by each player?

4. Gilbert weighed $137\frac{1}{4}$ lb. after practice. How did his loss in weight compare with the loss of the average player?

5. Using the same average, how much weight would have been worked off by the whole squad of thirty-five?

6. When the basketball season opened, twenty-one candidates reported to try out for the team. What per cent is this of the number on the football squad in problem 5?

7. The coach kept fifteen boys on the squad. What per cent was that of the number trying out?

8. The total weight of a team was 670 pounds. What was the average weight of each player?

9. Tom made 12 of the 52 shots made by his team. What per cent did he make?

10. The team played fourteen interscholastic games. Of these, it won eleven and lost three. What was its percentage for the season?

11. Two boys were practicing the broad jump for a track meet. James made three jumps, 17 ft. 2 in.; 18 ft. $4\frac{1}{4}$ in.; and 16 ft. 11 in. John made three jumps measuring 16 ft. $9\frac{1}{2}$ in.; 15 ft. $11\frac{1}{4}$ in.; and 17 ft. $1\frac{1}{2}$ in. The Junior High record is 20 ft. $3\frac{1}{4}$ in. How much does the best jump of each of the boys fall short of the school record?

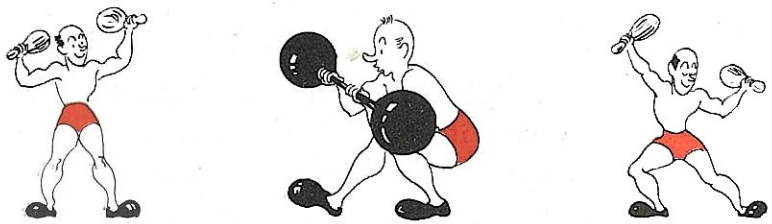
12. Paul can run a hundred yards in 11.5 seconds. The average for his team is 12.1 seconds. How much better is he than the average boy on his team? How does his record compare with the state record of 10.3 seconds?

13. The number of games won and lost by four different baseball teams is given below. Find the percentage of games won and rank the teams.

Team	Games Won	Games Lost
A	49	36
B	49	41
C	44	42
D	46	44

The standing of the team is given as a decimal fraction rather than as percentage. Change the percentages you have found to decimal fractions.

14. A baseball team's rating was .531 for one season. The team won 43 games; how many did it play?



Developing Power in Problem Solving

No pencils, please!

1. How many square feet of sail cloth are there in a triangular sail 18 ft. high and 9 ft. along the base?

2. A baseball diamond is a 90-ft. square. How many feet does a batter run in going all the way around the diamond?

3. Bill said his team won $\frac{1}{4}$ of all the games played in a series. If his team won 5 games, how many games were in the series?

4. Mary's softball team plans to play a series of 24 games. She said her team could win at least 18 of the games. What per cent would this be?

5. Air is a mixture of 78% nitrogen and 21% oxygen. What per cent of air is made of gases other than the two named?

6. A hall is 20′ x 10′ x 10′. How many cubic feet of air does it contain? How many cubic feet of oxygen?

7. Jack got a 5% discount on a football. If the discount was $.40, what was the original price of the ball? What did Jack pay for it?

8. Find the selling price of a $3.50 tennis racket marked to sell at a 10% discount.

Your Turn at Bat

1. (a) How is the charge made for the use of electricity? What is a kilowatt hour (K.W.H.)?

(b) What is the rate per K. W. H. if the charge for 75 K.W.H. is $3.00?

2. During May 87 K.W.H. were used. What should be the reading at the end of the month?

Kilowatt Hours

Reading for May 1

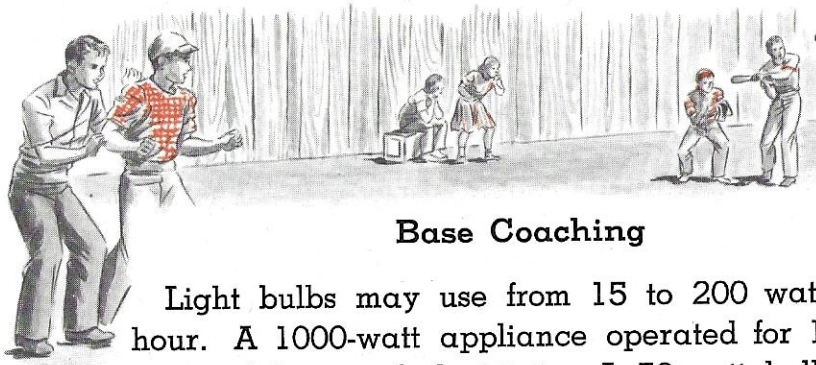
3. How is gas measured? What is the cost of 4200 cu. ft. of gas at 75¢ per thousand?

4. The dials below show the reading at the beginning of the month. What will be the reading after 37 hundred cu. ft. of gas have been used?

5. (a) How is the charge for water made?

(b) What is the average cost per month for water if during a quarter 1870 cu. ft. are used and the rate is 10¢ per thousand gallons?

If you made a perfect score, work page 297. Others do page 296.



Base Coaching

Light bulbs may use from 15 to 200 watts per hour. A 1000-watt appliance operated for 1 hour uses a kilowatt of electricity. A 50-watt bulb uses 1 kilowatt hour of electricity in 20 hours. The electric bill depends upon the appliances used and how long each is used.

The electric meter measures the electrical energy used. The meter shown below reads 5872 K.W.H. One month later, if 102 K.W.H. have been used, the meter will read 5974 K.W.H. Each month a new reading is taken, and the reading from the previous month is subtracted to find the number of K.W.H. used during the month.

Kilowatt Hours

1. Draw an electric meter reading 6439 K.W.H. On which two dials do the numbers run counter-clockwise?

2. Find the number of K.W.H. for:

Four 50-watt bulbs burning 3 hours each

Washing machine using 200 watts per hour for $2\frac{1}{2}$ hours

Radio using 75 watts per hour for 3 hours

Stealing Bases

After you have finished this page, help pupils now working page 296 to do these problems.

1. A school entertainment was held at night. If thirty 200W lights were used for 3 hours, what did the light cost at 6¢ per K.W.H?

2. Tom left a light burning in the basement from 8 P.M. to 6 A.M. How many K.W.H. did he waste if it was a 200W light?

Find the number of K.W.H. used in a month of 30 days by the following electrical appliances:

3. A 250W refrigerator running 8 hr. a day

4. A 550W iron used 24 hr. a month

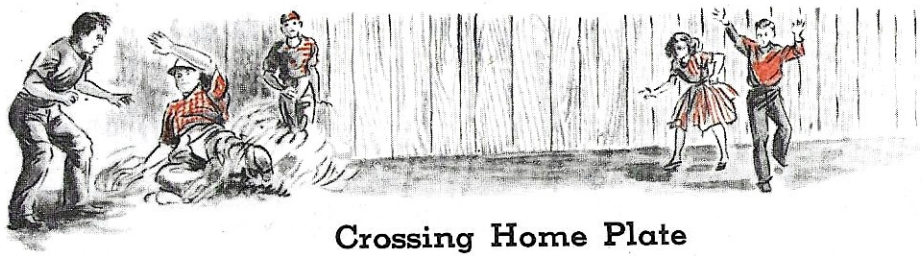
5. A 300W radio used 3 hr. a day

6. Find the cost of using a 400W washing machine 20 hr. if the electricity used costs 8¢ per K.W.H.

7. Why do some communities use artificial gas? How is it made?

8. What makes some water unsafe for drinking? How is the water supply in your community purified? How would you purify water if you had to use some that you felt was unsafe?

9. What are some of the precautions that must be taken in the use of electricity? Gas?



Crossing Home Plate

1. At the rate of $1.15 per thousand cubic feet, what is the charge for 4300 cubic feet of gas?

2. A gas meter reading is 16,300 cu. ft. The gas bill shows that 1500 cubic feet of gas have been used this month. What was the reading of the meter last month?

3. During one month a family used 1280 cu. ft. of water. How many gallons was this? At the rate of 15¢ per 1000 gallons, what will the water bill for the month be?

4. Find the cost of using a 60W electric fan 10 hours a day for 30 days at 10¢ per K.W.H.

5. Find the cost of 45 K.W.H. of current if the first 30 K.W.H. cost 8¢ per K.W.H., and the next 50 K.W.H. cost 4¢ per K.W.H.

6. What is saved by paying a $2.75 electric light bill before the end of the discount period, if the company allows an 8% discount for payment before a given date?

7. What is meant by a minimum bill?

8. A boy walked 7.2 mi. in 3.6 hr. How far did he walk in 1 hour?

9. An applicant for a private pilot rating must have 200 hours of solo flight. Tom has 80 solo hours. What per cent of the required time is this?

Adventure in Business

Father: There is a "For Sale" sign on Gray's Amusement Park.

Ted: How much is the park worth, Dad?

Father: The ground is worth about $65 an acre. I don't know how much Mr. Gray spent on the improvements. Of course, the worth of that sort of property depends altogether on how much money it will make. It has not been making money at all for Mr. Gray. That is the reason why he wants to sell. The expenses are more than the margin.

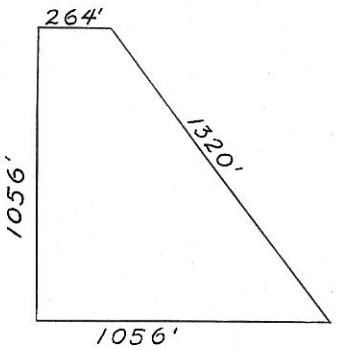
John: He ought to sell cheap, then. How much is he asking for it?

Father: I don't know how much he is asking, but I know he is tired enough of the whole business that he would accept any reasonable offer.

Bob: Let's buy it. You can help us plan, Dad. We boys and Joan will do our part.

Father: We will have to do some good, hard thinking first.

Appraising the Property



1. Gray's Park is a trapezoid with dimensions as shown in the figure. What is the area of the park in acres? How much is the ground worth?

2. Mr. Gray had built a fence 6 ft. high around the park. What was the cost of the lumber at $7.50 per 100 sq. ft.?

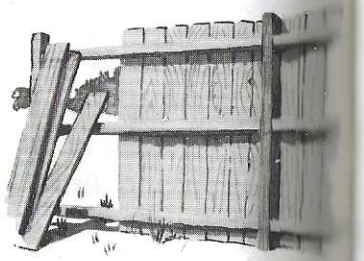
3. Mr. Gray had the fence posts set 8 ft. apart. Not considering entrances at all, what would the posts cost at $1.75 each?

4. The fence boards are vertical and nailed to three runners that extend from post to post. At 5¢ a foot, what is the worth of the runners?

5. A runner is 8 ft. long. It takes four 20-penny nails to nail a runner to two posts. There are 12 20-penny nails in a pound. At 8¢ a pound, what is the cost of the nails needed?

6. The boards are nailed to the runners. These nails are an average of 4 in. apart on each runner. There are 28 nails in a pound. At 9¢ a pound, what is the cost?

7. Hardware and gates cost $275. What was the total cost of the materials used in enclosing the park? Add 10% for waste.



8. It took a workman an average of $1\frac{1}{4}$ hours to dig a post hole and set the post. If the workman was paid $5 for an 8-hour day, how much did it cost to have the posts set? See Problem 3 for the number of posts.

9. Mr. Wood contracted to build the fence and gates for $300. He and two helpers worked 11 days each. Mr. Wood paid himself $12 a day and divided the remainder equally between the helpers. How much did each helper receive?

10. Find the sum of the following:

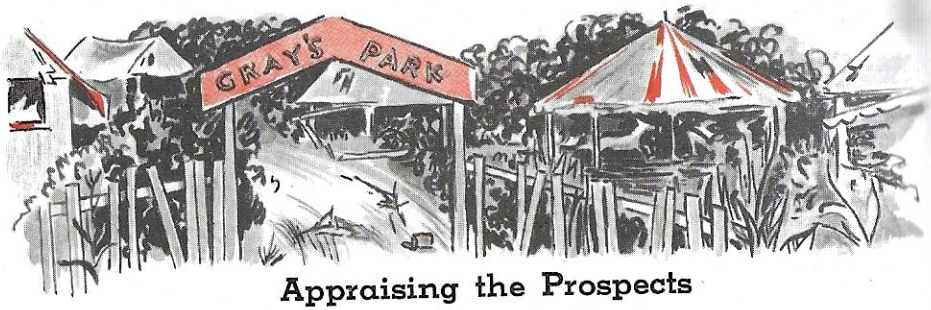
Plumbing material	$128.40
Plumber for 38 hours at $1.75 an hour	
Electrical material and lamps	$243.75
Electrician for 144 hours at $2.10 an hour	
Lumber and nails for grandstand	$355.80
Labor in constructing grandstand	$296.45
12 booths for concessions at $85 each	

11. Find the cost of the following furniture:

32 small tables at $6.50 each
64 small benches at $4.95 each
3 large tables at $18.75 each
120 chairs at $2.25 each

12. Find the total of the costs given in Problems 2 – 11.

13. Mr. Gray opened the park three years ago. During that time the improvements and furniture have lost 25% in value. What, then, is the present value of the ground, the improvements, and the furniture?



Appraising the Prospects

Father: Mr. Gray will sell the park as it is for $1500 cash. It would take $1500 more to get it in shape for opening, and for stock to sell.

Joan: You help us get the money, Dad. We will paint everything in bright colors and give it a new name: Merry Land. It will be the nicest place in miles for parties, picnics, ball games, and everything. We can make heaps of money.

Father: Before we go into such a business, we must do some careful thinking and figuring.

1. Check each item in Column A, and find the sum of Column A.

Some Yearly Fixed Expenses	Column A
Interest on $3000 at 6%	$180.00
Taxes on $2000 valuation at $1.85 per $100	37.00
Insurance on $2000 valuation at $4.25 per $1000	8.50
$20,000 liability insurance at $22.50 per $1000	450.00

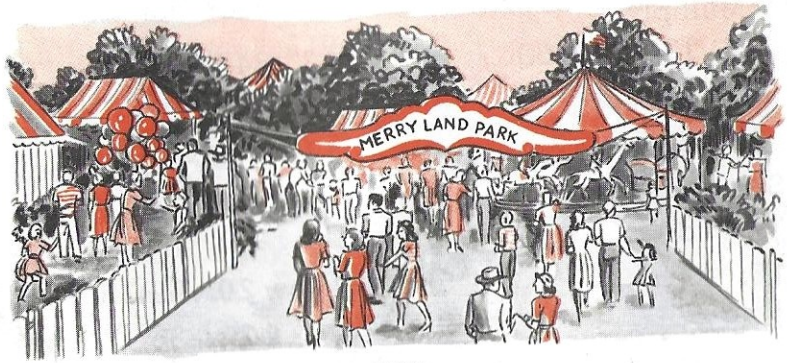
2. A gallon of paint covers about 325 square feet of fence with two coats. How many gallons will it take to cover both sides of the fence boards with two coats of paint? Count any part of a gallon in the answer as a whole gallon.

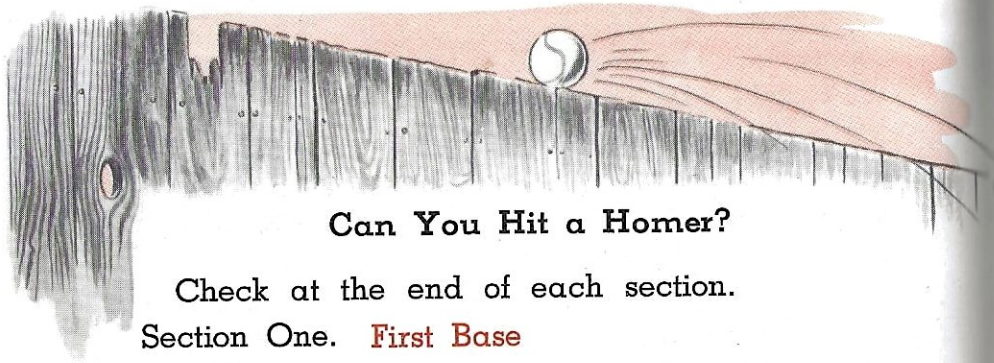
3. It will take $8\frac{1}{3}\%$ as much paint for the posts and runners as for the fence boards. How many gallons of paint are needed for the posts and runners? Count any part of a gallon in the answer as a whole gallon.

4. They estimated it would take 10 gallons of paint for the grandstand, 12 gallons for the booths, and 4 gallons for the furniture. At $2.95 a gallon, how much will it cost to buy paint for the fence boards, runners, and posts, for the grandstand, the booths, and the furniture?

5. Make a scale drawing of Merry Land, letting $1'' = 50'$. The main highway goes along the shortest side and a small river along the longest side.

On your scale drawing, show where you would place (a) the main entrance and any other entrances; (b) a baseball field; (c) the grandstand; (d) six picnic grounds; (e) a boat house; (f) roads through Merry Land; (g) booths where foods, drinks, and novelties are sold; (h) market stands.





Can You Hit a Homer?

Check at the end of each section.

Section One. First Base

Add:

1.	2.	3.	4.	5.
856	8407	$\frac{1}{4}$	$\frac{1}{3}$	$3\frac{1}{2}$
324	32	$\frac{3}{8}$	$\frac{3}{4}$	$6\frac{2}{3}$
705	675	$\frac{1}{2}$	$\frac{5}{6}$	$5\frac{3}{8}$
928	9014	$\frac{7}{8}$	$\frac{2}{5}$	$2\frac{3}{4}$
631	72			
450	833			
992	1448			

Section Two. Second Base

Subtract:

6. 75,032 from 94,131

7. 181,468 − 90,559

8. $83\frac{1}{3} - 18\frac{3}{4}$

9. $22\frac{1}{2}$ from $56\frac{1}{4}$

10. 1.89 from 4

11. 6.25 − 1.7

Section Three. Third Base

Multiply:

12. 1742 by 60

13. 845×903

14. $6\frac{3}{4} \times 2\frac{2}{3}$

15. $56\frac{1}{4} \times 6\frac{2}{3}$

16. 3.45×6.2

17. 7.75×8

Section Four. Home Run

Divide:

18. $42\overline{)3192}$

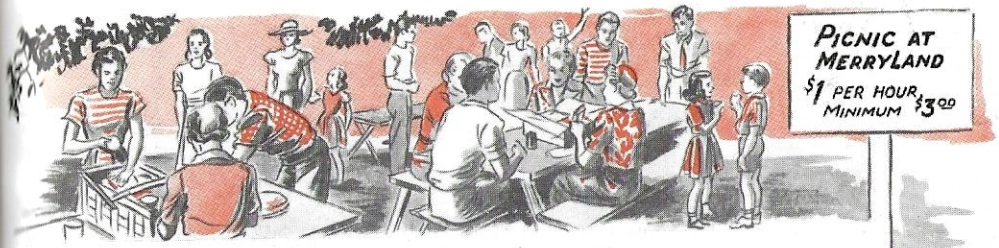
19. $78\overline{)3354}$

20. $59\overline{)3599}$

21. $18\frac{3}{4} \div 3$

22. $4.8\overline{)144}$

23. $36\overline{)17.28}$



Making Picnics Pay

1. If a picnic party uses the grounds for 4 hours, what is the charge? What is the charge if they use the grounds only $1\frac{1}{2}$ hours?

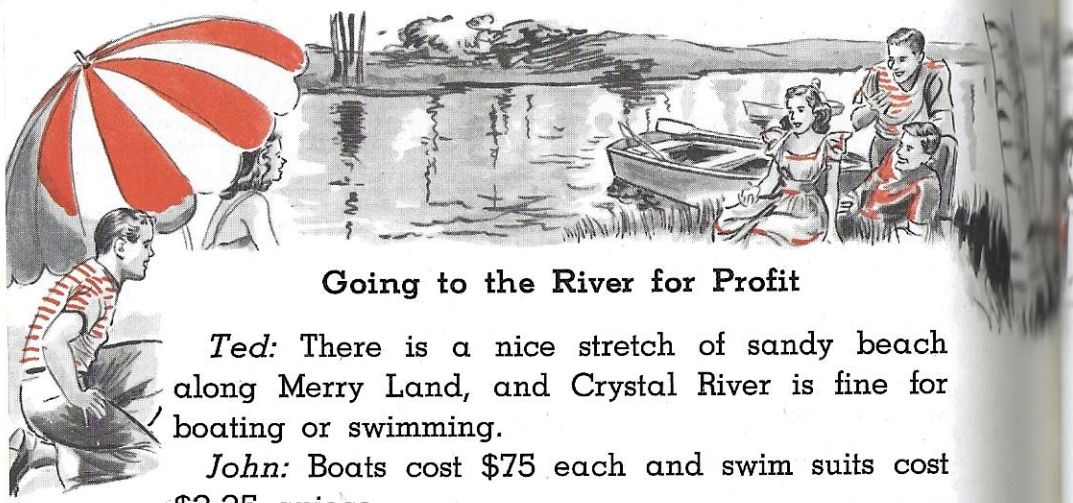
2. When a picnic party pays $3, $1.75 is considered as rent for grounds, 50 cents for wood used and 75 cents for cleaning grounds. Show this distribution in a circle graph.

3. What percentage of the $3 is allowed for (a) rent of grounds? (b) wood? (c) cleaning?

4. In a 6-month period, the owners collected $591 from picnic parties. How many dollars of this should be allowed for (a) rent of grounds; (b) wood; (c) cleaning grounds?

5. How many dollars must be collected from picnic parties in a year in order that the part allowed for rent of grounds be enough to pay the fixed expenses (Problem 1, page 302)?

6. Wood costs $16 a cord, and 50 cents' worth of wood is given to each party. How many parties can be served with one cord of wood?



Going to the River for Profit

Ted: There is a nice stretch of sandy beach along Merry Land, and Crystal River is fine for boating or swimming.

John: Boats cost $75 each and swim suits cost $2.25 apiece.

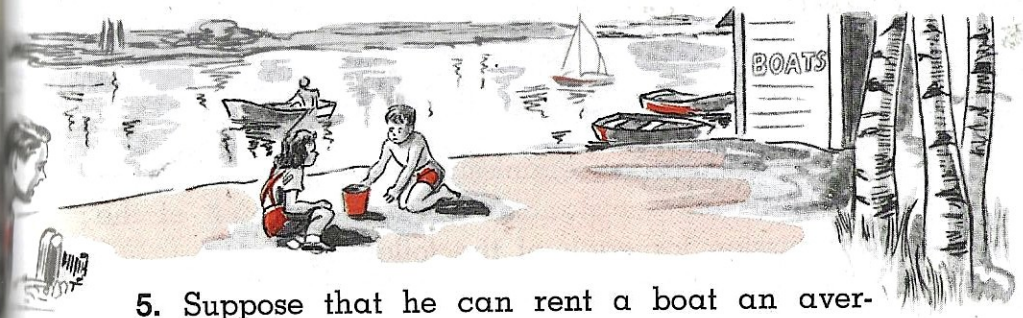
Bob: A dock for the boats, a boathouse, and locker room would cost about $1000.

1. Find the cost of 6 boats and 24 swimming suits.

2. Depreciation for boats and swimming suits is 25% a year and for dock and boathouse is 10% a year. What is the depreciation per year for 6 boats, 24 swimming suits, and $1000 for dock and boathouse?

3. Find the sum of these fixed yearly expenses: Depreciation $226.00; Interest at 6% on $1504, $90.24; Insurance $75.00.

4. Ted hopes he can rent each boat an average of 400 hours a year at 50 cents an hour. If he allows 25% of this for repairs and repainting, $12\frac{1}{2}$% for fixed expenses, and $37\frac{1}{2}$% for collecting for the boats when they are in use and caring for them when they are not in use, what is the yearly profit or loss on a boat?



5. Suppose that he can rent a boat an average of only 240 hours a year at 50 cents an hour and that the number of dollars of each of the other charges is the same as in Problem 4, what is the yearly profit or loss on a boat?

6. Suppose that he can rent a boat an average of 400 hours a year only by reducing the rent to 35 cents an hour, and the number of dollars of the other charges is as in Problem 4, what is the yearly profit or loss on a boat?

7. In a 10-day period, John took in the following amounts—

Rent for swimming suits, towels, and lockers:
162 at 50 cents each
13 at 75 cents each
8 at $1 each
Rent for lockers only: 96 at 50¢ each
How much money did John take in?

8. The expenses for the same 10-day period were—

Life Guard: 10 days at $2 a day
Locker Attendant: 10 days at $2.25 a day
Laundering Towels: 183 at $.03 apiece
Sterilizing Suits: 183 at $.04 apiece
What was the total of the expenses?

Market Stands in Merry Land

Bob collects a commission of 5% on all sales made at market stands. Find the amount of the commission for each of the following.

1. Farmer Grimes sold—

24 bu. of red Delicious apples at $3.60 a bu.

18 bu. of yellow Delicious apples at $3.85 a bu.

36 bu. of Winesap apples at $3.05 a bu.

42 bu. of Jonathan apples at $2.90 a bu.

9 bu. of winter pears at $2.35 a bu.

6 smoked hams at 76¢ a pound. (The weights of the hams were: 14 lb., 13$\frac{1}{4}$ lb., 19$\frac{3}{4}$ lb., 15$\frac{1}{2}$ lb., 18 lb., 21$\frac{1}{4}$ lb.)

226 lb. of fresh ham at 57$\frac{1}{2}$ a lb.

184 lb. of pork shoulders at 48$\frac{1}{2}$¢ a lb.

98 lb. of sausage at 62¢ a lb.

2. Farmer Matlock sold—

128 bu. of yellow corn at $2.05 a bu.

84 bu. of white corn at $1.98 a bu.

180 lb. of popcorn at 12$\frac{1}{2}$¢ a lb.

38 bags of meal at 65 cents a bag

88 pk. of sweet potatoes at $1.05 a peck

700 lb. of cabbage at 9$\frac{1}{2}$¢ a pound

194$\frac{3}{4}$ bu. of white potatoes at $3.50 a bu.

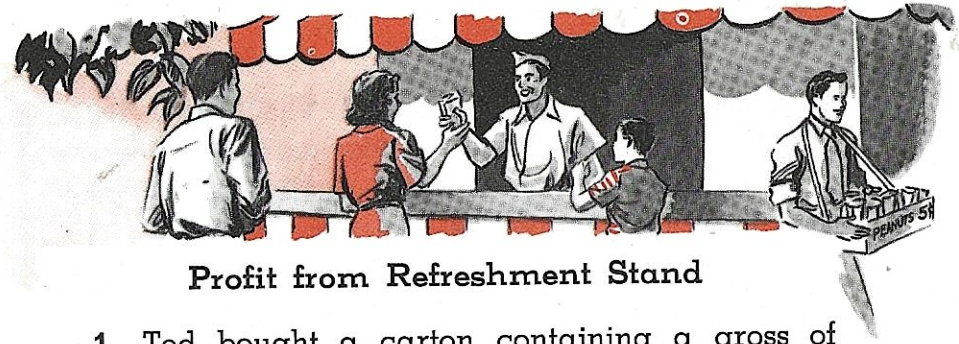
14$\frac{1}{2}$ pk. of onions at $1.50 a peck

3. Mrs. Porter sold—

164 doz. eggs at 55 cents a dozen

4 doz. frying chickens at $1.25 each

96 lb. of butter at rate of 1 lb. for 95¢



Profit from Refreshment Stand

1. Ted bought a carton containing a gross of packages of salted peanuts. The wholesale price for the carton was $4.50 less a 20% discount. It took 45 minutes of Ted's time and 20 cents in carfare to get the carton from the wholesaler to the ball field. Counting his time at 40 cents an hour, how much did the peanuts cost at the field?

2. Ted gave a boy 60 cents for walking through the crowd and selling the peanuts. The boy sold 141 packages at 5 cents each, had two packages lost or stolen, and Ted allowed the boy to eat one package. How much money did Ted actually receive for the peanuts sold?

3. Ted estimated that 25¢ of his margin on the peanuts must be set aside to help pay rent on the stand and for cleaning up around the stand after the game. How much, then, could Ted consider as profit on the sale of the peanuts?

4. A man in town sold fresh roasted peanuts at 35¢ a pound. By buying 50 pounds at one time, Ted got a discount of 16%. It cost him 50 cents to have the peanuts taken to the ball field. What was the cost of the peanuts at the field?

5. Ted paid a boy 50 cents to put the 50 pounds

of peanuts into 2-ounce bags. The empty bags cost 15 cents a hundred. How many bags were needed? What was the cost to Ted of the peanuts after they had been put in bags?

6. Ted gave Jack a commission of 10% for selling the peanuts at 5¢ a bag. He sold 384 bags. The others were lost, stolen, or spilled. How much did Jack earn? How much did Ted get?

7. Find, correct to the nearest tenth of a per cent, what per cent the profit on the peanuts was of the selling price.

8. Ted bought 2 boxes of chocolate bars at $1.50 a box less a 10% discount, and 4 boxes of chocolate bars at $1.60 a box less a 15% discount. It cost 75 cents to have the chocolate bars delivered to the ball field. How much did the 6 boxes cost at the field?

9. He sold all the candy bars (48 in each box) at 5¢ each. He set aside 10% of the sales toward overhead of the stand. How much was his profit?

10. What percentage was the profit on the candy bars of the total candy bar sales?

11. One week Ted bought boxed popcorn delivered to the field at $3.75 per hundred boxes, less a discount of 12%. He sold 400 boxes at 5¢ a box. The loss and the expenses of selling amounted to 10% of the sales. What was his percentage of profit, based on his total sales?

12. Wieners are 72¢ a pound, with an average of 11 wieners to the pound, and mustard enough for four pounds of wieners costs 35¢. Buns are 24¢ a dozen. Ted estimated 25% of the sale price is needed to cover overhead (transportation, selling, and losses). One Saturday Ted sold 22 dozen wiener sandwiches at 15¢ each.

How many pounds of wieners did he sell, and what did the wieners cost?

How much did the mustard cost?

How much did the buns cost?

How much did Ted take in from the sale of the sandwiches?

What was his profit?

What was the percentage of profit, to the nearest tenth of a per cent, based on the total sales?

If he had sold the wiener sandwiches at 10¢ each, would he have gained or lost? How much?

Do you think he should have sold them at 2 for 25¢?

13. One Saturday Ted sold 12 gallons of ice cream, serving 48 cones at ten cents from a gallon. The ice cream cost $1.20 a gallon with a discount of $12\frac{1}{2}\%$, and the cones cost $1.25 a gross with a discount of 5%. The overhead was $33\frac{1}{3}\%$ of the total sales.

How many ice cream cones did he sell?

What was the net cost of the ice cream?

What was the net cost of the cones?

What were his total sales? What was his profit?

Profits from Playthings

1. Joan buys balloons wholesale at 90 cents a gross, less a discount of $16\frac{2}{3}\%$. What is the actual cost of a gross?

2. Joan sells the balloons at 5 cents each. What does she make on 15 gross?

3. Rubber balls cost $4 a hundred, less $12\frac{1}{2}\%$ discount. What is the actual cost of 100 rubber balls?

4. In one week, Joan sold 300 rubber balls at 10 cents each. How much did she make?

5. Dolls with painted hair cost $1.25 a dozen, 20% discount; dolls with real hair cost $6 a dozen, 25% discount. What does each kind cost?

6. How much does Joan make in selling five dozen dolls with painted hair at 20 cents each?

7. How much does Joan make in selling two dozen of the dolls with real hair at 75 cents each?

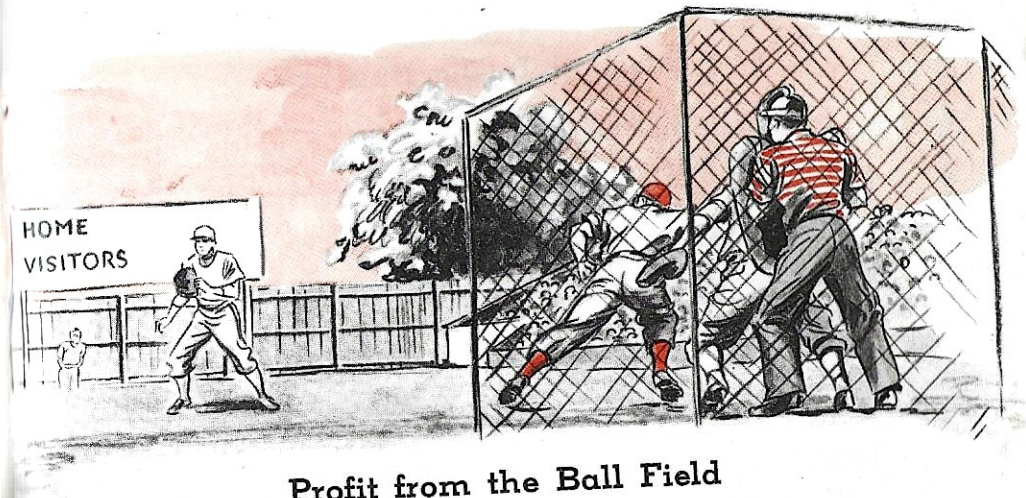
8. Marbles cost 75 cents per 1000, 4% discount. Bags cost 35 cents per 100. Joan packs 40 marbles in each bag and sells them at 10 cents a bag. She sold 200 bags of marbles.

What was the actual cost of the marbles?

What was the cost of the bags?

What was her profit on the marbles she sold?

9. Canes cost $2.50 a gross, discount 10%. What is the actual cost of 6 gross? At 5¢ each, what is the selling price of 6 gross of canes?



Profit from the Ball Field

1. If Bob makes $2\frac{1}{3}$ cents on each bottle of soda, how much does he make on the sale of 360 bottles?

2. If he makes $2\frac{1}{4}$ cents on each ice-cream cone, how much does he make in selling 420 ice-cream cones?

3. If he makes $3\frac{3}{4}$ cents on each bag of popcorn, how much does he make when he sells 228 bags?

4. Bob pays $1.80 per bushel for apples. If there is an average of 120 apples in a bushel, what is the average cost of one apple?

5. He sells the apples at 3 for 10 cents. How much does he make on each apple?

6. He paid $3 for 24 pounds of roasted peanuts. How much was this a pound?

7. How many bags each holding $\frac{3}{8}$ lb. can Bob fill from 72 lb. of peanuts?

Baseball Is Big Business

Bob believes that baseball can be made into a profitable business for Merry Land. In his planning for Merry Land, he read these baseball facts in a sports manual.

World Series	No. of Games	Admissions Sold	Gate Receipts	Winner Received	Loser Received
1935	6	286,672	$1,173,794	$6,545	$4,198
1940	7	281,927	1,322,328	5,803	3,531
1945	7	233,457	1,592,454	6,443	3,930
1950	4	196,009	953,669	5,737	4,081

1. As shown above, in what year were the gate receipts most? In what year were they least?

2. What was the average number of paid admissions to a game in each series above? Hint: For 1935, divide 286,672 by 6.

3. What were the average gate receipts to a game in each series above?

4. What was the average cost in dollars and cents to a game in each series above? Hint: For 1935, divide $1,173,794 by 286,672.

5. The players' fund is made up of 60% of the gate receipts of the first four games of a world series. Can you see any reason for not giving the players a part of the gate receipts of later games?

6. Assume that the gate receipts were the same for each game of a series, what was the amount of the receipts for the first four games in each series above?

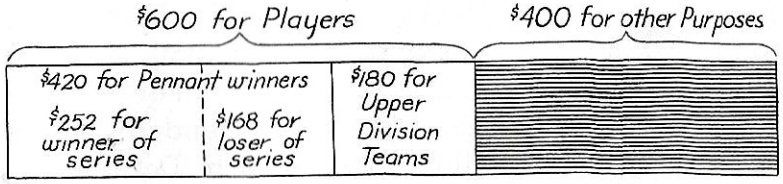
7. Find 60% of each answer in Problem 6. Tell the use made of each of these amounts.

8. Of the players' funds (see Problem 7 for amounts), 70% is divided between the teams that play the world series (pennant winners), and 30% is divided among the teams that ranked second, third, and fourth in their respective leagues (upper division teams). For each world series above, what was the amount for the pennant winners and what was the amount for the other upper division teams?

9. Three-fifths of the money allowed the pennant winners is given to the team that wins the world series and two-fifths to the losing team. Find the amount due the winning team and the amount due the losing team in each series above.

10. Before a world series is played, the players decide how the money is to be divided. Do you think that each team would divide their money into the same number of shares? Why? What could be a reason for giving fractional parts of shares to some?

11. The graph below shows how $1000 of gate receipts of the first four games of a world series is divided.


$600 for Players
$400 for other Purposes
$420 for Pennant winners
$180 for Upper Division Teams
$252 for winner of series
$168 for loser of series

Attendance at Big League Games

The table below gives the total attendance at major league games in a recent year.

American League		National League	
New York	1,950,107	Brooklyn	1,282,628
Cleveland	1,704,984	New York	1,059,539
Chicago	1,328,234	St. Louis	1,013,429
Boston	1,312,282	Pittsburgh	980,590
Detroit	1,132,641	Philadelphia	937,658
Washington	695,167	Chicago	894,415
Philadelphia	465,469	Cincinnati	588,268
St. Louis	293,790	Boston	487,475

1. Find the total attendance at American League games. At National League games.

2. Find the total attendance at games in both leagues.

3. What cities have teams in both leagues? For each of these cities, find which team (American League or National League) had greater total attendance, and how much greater.

4. How many more persons attended games (both leagues) in New York than in Chicago?

5. How many more persons attended games (both leagues) in Boston than in Detroit?

6. How many more persons attended National League games in Brooklyn than in St. Louis?

7. Did more persons attend games (both leagues) in Boston or in St. Louis? How many more?

8. How many more persons attended games (both leagues) in Philadelphia than in Detroit?

9. Round to the nearest hundred thousand the total number of persons that attended games in each of the cities.

10. Find the population of each city named in the table above, and round each of the populations to the nearest 100,000.

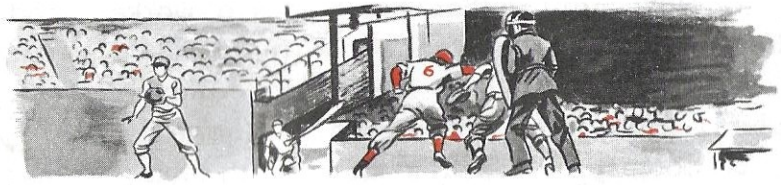
11. Use the rounded numbers to find what percentage the baseball attendance was of the population of each city. (For Boston the answer is $1{,}800{,}000 \div 800{,}000 = 2.25 = 225\%$.)

12. One year 431,297 persons attended major league games in Cincinnati, and the next year only 294,787 persons attended. Round each of these numbers to the nearest 10,000. Subtract the rounded numbers.

13. Following the 1945 World Series, the upper division teams of each league received the following:

Second teams	$35,668.43 each
Third teams	23,778.95 each
Fourth teams	11,889.48 each

What was the total received by the upper division teams? How does this compare with the answer you found in Problem 8 on page 315? How do you account for the difference?



Developing Power in Problem Solving

Write the process or processes needed to solve a problem. Where necessary, write the fact or facts you must know to solve. Do not solve.

1. Ann needs 48 cup cakes. The cakes come 3 in a package. How many packages should Ann buy?

2. Mr. Ellis bought four shirts at $3.25 each. How much did they cost?

3. Sarah has $1.25 in her purse and $3.87 in a drawer at home. How much will she have left if she pays $4.75 for a sweater?

4. It takes Jane 12 minutes to walk to school and 5 minutes to hang up her wraps and get seated. By what time must she leave home in order to be in her seat by 9 A.M.?

5. Mrs. Harris wants to buy enough cookies so that each pupil in Eva's room may have twelve cookies. How many pounds of cookies should Mrs. Harris buy?

6. What is the average weight of the boys in your room?

7. How many button holes does a worker need to make per hour in order to earn $17.50 a week?

8. Edith gave three pieces of candy to each child. How many pieces did she have left?

9. Solve problems 1 to 8.

Percentage Review

Check at the end of each section.

Section One.

Copy these equations. Fill in each blank.

1. $\frac{1}{2}=\_\_$ $=\_\_\%$ $\frac{1}{4}=\_\_$ $=\_\_\%$

2. $\_\_=.75$ $=\_\_\%$ $\_\_=.40=\_\_\%$

3. $\frac{1}{3}=\_\_$ $=\_\_\%$ $\_\_=\_\_$ $=90\%$

4. $\_\_=\_\_$ $=60\%$ $\frac{1}{5}=\_\_$ $=\_\_\%$

5. $\_\_=.66\frac{2}{3}=\_\_\%$ $\_\_=.80=\_\_\%$

6. $\_\_=\_\_$ $=12\frac{1}{2}\%$ $\_\_=\_\_$ $=16\frac{2}{3}\%$

Section Two. Find the missing numbers.

7. 5% of $800=\_\_$ $.1\%$ of $1200=\_\_$

8. $4\frac{1}{2}\%$ of $600=\_\_$ 300% of $400=\_\_$

9. $\_\_\%$ of $500=20$ $\_\_\%$ of $1000=2$

10. $\_\_\%$ of $600=21$ $\_\_\%$ of $600=1500$

11. 6% of $\_\_=15$ $.6\%$ of $\_\_=9$

12. $7\frac{1}{2}\%$ of $\_\_=30$ 625% of $\_\_=125$

Section Three. Find the interest.

	13.	14.	15.	16.	17.	18.
Principal	$200	$240	$680	$720	$12.50	$320
Rate	6%	5%	$4\frac{1}{2}\%$	$3\frac{1}{2}\%$	6%	$2\frac{1}{2}\%$
Time	1 yr.	$1\frac{1}{2}$ yr.	1 yr.	$2\frac{1}{2}$ yr.	8 mo.	9 mo.

19. Bill sold a chair for 25% more than it cost. If he sold it for $60, what was the cost?

20. Ted sold a table at a profit of 25% of the selling price. He sold it for $30. Find the cost.

Review of Measures

Choose a partner. Check papers at end of each section. Review Tables of Measures on pages 323 and 324 if you make mistakes.

Section One

Write the number that belongs in place of each ?.

1. ? in. = 1 ft.
2. ? ft. = 1 yd.
3. ? in. = 1 yd.
4. ? ft. = 1 rd.
5. ? yd. = 1 rd.
6. ? ft. = 1 mi.
7. ? yd. = 1 mi.
8. ? rd. = 1 mi.
9. $1\frac{1}{2}$ ft. = ? in.
10. $2\frac{3}{4}$ ft. = ? in.
11. $\frac{1}{4}$ mi. = ? rd.
12. $\frac{3}{8}$ mi. = ? ft.
13. 4 rd. = ? yd.
14. 440 yd. = ? mi.
15. 42 in. = ? ft.
16. 880 ft. = ? mi.

Section Two

Leave each answer in simplest form:

1. Add.

2 ft.	8 in.	
1 ft.	9 in.	
2 ft.	11 in.	

2. Add.

28 rd.	4 yd.	2 ft.
35 rd.	3 yd.	1 ft.
19 rd.	5 yd.	2 ft.

3. Subtract.

8 mi.	184 rd.
3 mi.	274 rd.

4. Multiply.

28 rd. 4 yd. × 6

5. Multiply.

1 yd. 2 ft. 9 in. × 3

6. Divide.

7)18 ft. 8 in.

Section Three

Write the number that belongs in place of each ?.

1. 12 sq. ft. = ? sq. yd.
2. $2\frac{1}{2}$ sq. ft. = ? sq. in.
3. $\frac{1}{4}$ acre = ? sq. rd.
4. ? pt. = 1 gal.
5. 72 sq. in. = ? sq. ft.
6. ? sq. ft. = 1 acre
7. $\frac{3}{4}$ sq. mi. = ? acres
8. 24 qt. = ? gal.

Merry Land's First Birthday

When Merry Land was exactly one year old Father and the rest of the family completed this statement. Study it carefully.

Income and Expense Statement

	Income
Ball park and picnic grounds	$11,755.00
Swimming, boating, dancing	3,600.00
Receipts from novelty and refreshment booths	9,250.00
Commissions from market stands	375.00
Total Income	$24,980.00
	Expenses
Salary Father paid himself	$ 1,500.00
Wages	5,400.00
Heat, light, power	585.50
Equipment, supplies, merchandise	10,920.25
Depreciation	875.50
Insurance	569.25
Telephones	144.00
Advertising	300.75
Losses	120.75
Interest paid on loan	180.00
Payment on principal of loan	2,000.00
Total Expenses	$22,596.00
	Profits
Net profit	$ 2,384.00
Salary Father paid himself	1,500.00
From telephones, vending and amusement machines	375.00
Inventory of equipment, merchandise	1,675.00
Amount paid on principal of loan	2,000.00
Total Profit	$ 7,934.00

Crossing Home Plate

You will find facts for answering these questions in the statement on page 321.

1. How is the net profit found?

2. Does the total profit seem unusually large on an investment of $3000? What per cent of the investment is the total profit?

3. When you consider that the total profit includes the earnings of father, mother and three children, does it seem unreasonable?

4. Where did they get $22,596.00 to spend for expenses, when the original capital was only $3000? What is meant by "rapid turn-over" of capital?

5. What were the gross sales at the market stands, if the rate was 5% and the commission $375.00?

6. Explain why the interest on the loan is considered an expense. Why is the payment on the principal considered profit?

7. What was the original loan? (See page 302.) How much was this loan reduced the first year? Find the interest on the balance, at 6%, for the second year.

8. During what months of the year do you think the expenses might be greater than the profits?

Table of Length

12 inches (in.) = 1 foot (ft.)
3 feet (ft.) = 1 yard (yd.)
$16\frac{1}{2}$ feet (ft.) / $5\frac{1}{2}$ yards (yd.) = 1 rod (rd.)
5,280 feet / 1,760 yards / 320 rods (rd.) = 1 mile (mi.)

Table of Area or Square Measure

144 square inches (sq. in.) = 1 square foot (sq. ft.)
9 square feet (sq. ft.) = 1 square yard (sq. yd.)
$30\frac{1}{4}$ square yards (sq. yd.) = 1 square rod (sq. rd.)
43,560 square feet / 160 square rods (sq. rd.) = 1 acre (A.)
640 acres (A.) = 1 square mile (sq. mi.)

Table of Volume or Cubic Measure

1728 cubic inches (cu. in.) = 1 cubic foot (cu. ft.)
27 cubic feet (cu. ft.) = 1 cubic yard (cu. yd.)
128 cubic feet (cu. ft.) = 1 cord (C.)

Table of Liquid Measure

2 cups = 1 pint (pt.)
2 pints (pt.) = 1 quart (qt.)
4 quarts (qt.) = 1 gallon (gal.)
1 gallon (gal.) = 231 cubic inches (cu. in.)
$7\frac{1}{2}$ gallons (gal.) = 1 cubic foot (cu. ft.)

Dry Measure	Avoirdupois Weight
2 pt. = 1 qt.	16 oz. = 1 lb.
8 qt. = 1 pk.	100 lb. = 1 cwt.
4 pk. = 1 bu.	2000 lb. = 1 T.

Measurements of Time

60 seconds (sec.) = 1 minute (min.)
60 minutes (min.) = 1 hour (hr.)
24 hours (hr.) = 1 day (da.)
7 days (da.) = 1 week (wk.)
30 days (da.) = 1 business month
4 weeks (wk.) = 1 business month
30 (29, 28, 31) days = 1 month (mo.)
52 weeks (wk.) = 1 year (yr.)
12 months (mo.) = 1 year (yr.)
360 days (da.) = 1 business year
365 days (da.) = 1 common year
366 days (da.) = 1 leap year
10 years (yr.) = 1 decade
10 decades = 1 century
100 years = 1 century

Counting Things

12 things = 1 dozen (doz.)
12 dozen (doz.) = 1 gross (gro.)
144 things = 1 gross (gro.)

Miscellaneous Measures

6 ft. = 1 fathom
6080.20 ft. = 1 nautical mile
3 nautical miles = 1 league
2240 lb. = 1 long ton
2150.42 cu. in. = 1 bu.
$1\frac{1}{4}$ cu. ft. = 1 bu.

The 100 Addition Facts

You must be able to add well to do the problems on page 5. Practice on this page and on page 326 will make it easy.

Say the sums to a partner, or write them.

1.	2	3	4	0	6	8	8	6	1	9
	4	0	5	8	0	3	2	4	4	1
2.	5	6	3	4	1	7	2	2	2	4
	0	6	2	3	5	1	9	5	8	4
3.	4	3	4	1	9	7	2	6	5	3
	1	1	0	8	9	7	0	1	4	3
4.	1	9	8	1	1	1	2	2	5	0
	1	2	8	3	6	7	1	2	5	0
5.	8	0	7	1	0	8	6	0	3	0
	7	1	2	9	5	1	2	4	6	2
6.	8	1	5	4	1	5	0	0	5	7
	0	0	2	2	2	3	3	9	1	0
7.	3	3	3	2	3	6	7	2	8	4
	8	4	9	3	5	3	3	7	4	8
8.	8	7	5	9	6	6	5	7	0	9
	5	9	8	7	8	9	7	8	7	8
9.	4	7	7	9	3	9	2	9	0	6
	6	6	4	6	7	0	6	3	6	5
10.	5	8	8	4	7	4	9	9	6	5
	9	9	6	7	5	9	5	4	7	6

Extra Practice in Addition

1.	3	4	9	26	38	495	759	783
	5	2	7	25	63	847	872	726
	3	6	5	83	28	496	537	140
2.	5	4	7	28	69	240	356	653
	3	0	2	55	70	305	516	380
	1	3	4	11	43	875	208	717
	2	8	4	96	53	715	439	614
3.	1	8	7	78	46	387	904	203
	4	3	6	96	24	211	236	872
	3	7	3	70	71	823	360	708
	2	7	5	42	69	390	823	671
	4	4	3	97	27	667	735	600
4.	8	9	2	50	28	310	387	782
	7	2	0	43	43	402	297	563
	6	5	4	96	67	566	407	924
	3	8	7	6	84	73	68	647
	1	4	9	21	20	901	200	983
	3	7	3	4	7	50	8	216
5.	2	6	4	14	90	200	415	709
	5	4	2	98	32	773	380	433
	4	3	8	11	64	476	667	508
	3	4	5	50	98	367	839	744
	4	2	3	44	15	322	500	408
	4	6	2	17	71	449	407	225
	4	9	8	53	35	443	992	104

The 100 Subtraction Facts

Master the subtraction facts below, and find the remainders on page 328 quickly and correctly.

Say the remainders to a partner, or write them.

1.	0	5	7	3	3	6	4	8	1	5
	0	1	7	2	3	6	2	1	1	4
2.	5	9	9	4	9	6	8	5	4	7
	3	9	1	4	8	5	4	5	3	1
3.	3	6	5	2	6	6	7	2	4	8
	1	3	2	1	1	4	5	2	1	7
4.	9	7	10	6	10	11	8	10	12	7
	5	6	2	2	1	2	6	7	6	2
5.	9	6	7	9	8	10	8	9	5	3
	0	0	3	3	8	4	2	6	0	0
6.	4	9	9	2	8	10	10	12	7	8
	0	4	7	0	0	6	5	9	0	3
7.	1	12	7	10	12	14	10	10	9	11
	0	8	4	8	4	7	9	3	2	8
8.	11	8	15	13	11	11	18	16	11	11
	5	5	8	6	7	9	9	8	6	4
9.	12	12	14	15	12	11	13	14	13	16
	7	5	8	6	3	3	8	6	7	7
10.	13	13	15	17	15	17	14	16	13	14
	5	9	7	8	9	9	5	9	4	9

Extra Practice in Subtraction

1.	97	89	74	61	53	45	53	90	70
	43	6	9	13	49	30	3	18	63
2.	23	37	97	44	48	79	55	58	85
	5	32	60	8	22	43	16	40	73
3.	846	754	956	672	430	904	700		
	321	427	664	284	243	645	286		
4.	857	435	763	986	738	652	938		
	200	204	405	577	459	564	65		
5.	602	835	500	750	217	185	340		
	54	746	201	46	134	92	270		
6.	8438	7753	9848	6448	5940	8712			
	2324	6228	6352	2523	2235	3339			
7.	2063	8002	7020	8406	7056	8010			
	1405	4631	5411	2308	2059	7020			
8.	67,134	73,192	40,235	52,208	77,846				
	23,122	22,810	31,140	23,509	69,984				
9.	84,638	80,018	50,402	23,002	60,108				
	9,545	28,032	19,253	7,908	28,088				

The 100 Multiplication Facts

On page 11, you will test your multiplication. The practice below and on page 330 will make the test on page 11 easy.

Say the products to a partner, or write them.

1.	6	4	8	9	5	9	7	1	5	8
	2	1	8	7	9	6	3	5	4	0
2.	9	4	7	8	4	3	1	8	4	7
	3	6	1	5	8	9	7	9	3	2
3.	9	8	4	6	3	8	6	2	7	8
	4	6	7	9	4	1	4	5	7	3
4.	3	2	8	6	3	5	3	2	4	7
	8	7	4	3	1	5	2	6	9	5
5.	0	6	6	1	2	4	2	9	3	5
	6	8	1	3	2	5	4	9	7	6
6.	9	3	9	8	4	7	0	1	3	7
	8	3	0	7	0	0	4	2	6	9
7.	7	6	8	1	0	7	9	1	6	5
	8	5	2	0	7	6	5	9	6	2
8.	6	4	0	3	0	2	5	9	5	2
	7	4	2	0	0	1	3	2	8	9
9.	1	3	2	9	1	7	5	5	1	1
	8	5	8	1	6	4	1	7	4	1
10.	0	0	2	6	0	0	2	0	5	4
	9	5	3	0	1	8	0	3	0	2

Extra Practice in Multiplication

Check each multiplication carefully. When a product is not correct, be sure you find the mistake, and then practice to make sure you will not make the same mistake again.

1.	79	91	46	38	85	77	87	84	93
	58	91	38	63	86	83	76	43	19
2.	26	89	54	39	48	78	88	32	48
	43	27	35	54	35	22	46	69	36

3.	641	372	483	609	705	420	230
	7	9	8	6	4	60	70
4.	627	413	768	840	960	807	706
	39	41	52	63	74	850	970
5.	432	312	211	634	209	703	640
	328	406	503	139	598	664	603

6.	3536	6346	8259	8334	7303	7036
	8	9	7	6	40	50
7.	8248	9060	5469	2493	8438	8009
	63	92	47	66	420	850

8.	34,866	32,491	63,828	65,942	37,674
	7	9	4	30	60
9.	82,965	30,482	72,082	97,107	78,009
	56	47	38	290	970

The 90 Division Facts

Say or write the answers quickly.

1.	$3\overline{)15}$	$6\overline{)24}$	$1\overline{)8}$	$2\overline{)10}$	$4\overline{)4}$	$9\overline{)63}$
2.	$8\overline{)40}$	$5\overline{)45}$	$6\overline{)54}$	$7\overline{)42}$	$7\overline{)7}$	$8\overline{)72}$
3.	$3\overline{)27}$	$6\overline{)0}$	$5\overline{)20}$	$9\overline{)45}$	$7\overline{)5}$	$4\overline{)32}$
4.	$7\overline{)49}$	$8\overline{)32}$	$7\overline{)28}$	$9\overline{)81}$	$6\overline{)6}$	$9\overline{)27}$
5.	$5\overline{)40}$	$9\overline{)72}$	$6\overline{)36}$	$8\overline{)64}$	$6\overline{)0}$	$4\overline{)36}$
6.	$7\overline{)63}$	$5\overline{)35}$	$6\overline{)42}$	$8\overline{)56}$	$9\overline{)9}$	$5\overline{)25}$
7.	$9\overline{)54}$	$4\overline{)28}$	$4\overline{)0}$	$8\overline{)48}$	$5\overline{)0}$	$1\overline{)6}$
8.	$1\overline{)4}$	$3\overline{)9}$	$6\overline{)6}$	$3\overline{)24}$	$9\overline{)9}$	$3\overline{)0}$
9.	$2\overline{)0}$	$6\overline{)18}$	$1\overline{)2}$	$3\overline{)12}$	$2\overline{)3}$	$3\overline{)3}$
10.	$2\overline{)14}$	$4\overline{)4}$	$3\overline{)21}$	$8\overline{)8}$	$8\overline{)0}$	$4\overline{)12}$
11.	$4\overline{)20}$	$1\overline{)9}$	$7\overline{)0}$	$7\overline{)14}$	$2\overline{)1}$	$6\overline{)12}$
12.	$8\overline{)24}$	$5\overline{)15}$	$9\overline{)0}$	$2\overline{)6}$	$1\overline{)1}$	$3\overline{)6}$
13.	$1\overline{)7}$	$5\overline{)5}$	$5\overline{)0}$	$4\overline{)8}$	$2\overline{)2}$	$9\overline{)18}$
14.	$1\overline{)5}$	$2\overline{)16}$	$1\overline{)0}$	$3\overline{)18}$	$2\overline{)2}$	$8\overline{)16}$
15.	$1\overline{)1}$	$4\overline{)16}$	$7\overline{)7}$	$2\overline{)8}$	$5\overline{)0}$	$0\overline{)0}$
16.	$6\overline{)21}$	$8\overline{)53}$	$5\overline{)37}$	$7\overline{)31}$	$9\overline{)5}$	$5\overline{)41}$
17.	$9\overline{)55}$	$7\overline{)65}$	$4\overline{)15}$	$7\overline{)59}$	$6\overline{)3}$	$7\overline{)32}$

Extra Practice in Division

Work a row at a time. Check. When an answer is wrong, find the mistake.

1.	7)2345	8)6584	6)2280	7)4704	9)2997
2.	6)3720	9)4860	7)3010	5)2950	8)7760
3.	9)2835	7)1395	8)7860	9)7743	6)8934
4.	8)2432	7)3549	9)8154	6)4845	5)4518
5.	85)595	74)518	62)124	71)497	56)336
6.	92)276	61)427	46)276	86)688	71)568
7.	97)291	77)616	47)188	89)356	58)232
8.	56)280	87)261	79)474	37)518	49)588
9.	38)3306	47)3854	58)4756	63)4865	57)4631
10.	63)4914	59)4484	27)1701	34)2958	39)2886
11.	18)1188	16)928	17)629	19)1197	18)1476
12.	69)2898	86)4472	57)2964	94)6016	48)3560
13.	75)33975	54)11556	83)37599	92)58524	
14.	59)38876	48)39806	77)38976	68)73654	
15.	711)28451	539)21607	941)56518	880)54560	
16.	163)6856	892)26760	205)8913	116)27852	

17.	73)1679	64)5952	91)2912	82)2900	43)1849
18.	84)4541	65)2730	94)6917	30)7837	90)6750
19.	86)6536	49)3577	68)5168	57)5073	27)1890
20.	19)1615	16)1389	18)1288	17)1496	19)9443
21.	82)41326	95)58995	76)61560	275)165820	
22.	59)12213	73)31536	42)126252	938)135072	
23.	87)10962	63)19845	95)39330	537)724950	
24.	62)30904	87)43296	72)46884	479)186280	
25.	16)47869	18)24376	87)43413	582)390628	
26.	47)14194	84)484812	63)12915	241)114168	
27.	28)15000	31)18820	67)34125	429)342150	
28.	24)19738	38)34227	73)66509	706)493325	
29.	15)10996	14)29984	12)76510	168)564003	
30.	47)34012	76)57200	63)12598	905)500913	
31.	93)77504	81)65442	52)39673	519)638000	
32.	78)25764	66)26466	41)32882	706)342699	
33.	80)65640	51)35751	44)80854	507)375470	
34.	88)17666	96)48096	23)71323	616)308308	
35.	26)15660	32)17288	13)16965	500)385750	

Extra Practice in Adding Fractions

1. Find the least common denominator of each column, each row, and each diagonal of the squares below.

$\frac{1}{3}$	$\frac{1}{4}$
$\frac{1}{5}$	$\frac{1}{6}$

$\frac{1}{2}$	$\frac{1}{3}$
$\frac{1}{4}$	$\frac{1}{6}$

$\frac{1}{4}$	$\frac{1}{5}$
$\frac{1}{6}$	$\frac{1}{8}$

$\frac{1}{5}$	$\frac{1}{6}$
$\frac{1}{8}$	$\frac{1}{10}$

$\frac{1}{8}$	$\frac{1}{2}$	$\frac{1}{12}$
$\frac{1}{4}$	$\frac{1}{16}$	$\frac{1}{5}$
$\frac{1}{6}$	$\frac{1}{3}$	$\frac{1}{10}$

$\frac{1}{6}$	$\frac{1}{15}$	$\frac{1}{2}$
$\frac{1}{8}$	$\frac{1}{5}$	$\frac{1}{16}$
$\frac{1}{3}$	$\frac{1}{10}$	$\frac{1}{4}$

$\frac{3}{4}$	$\frac{1}{3}$	$\frac{5}{6}$
$\frac{1}{6}$	$\frac{2}{3}$	$\frac{3}{8}$
$\frac{1}{2}$	$\frac{5}{8}$	$\frac{1}{4}$

Find the sums.

2.

$1\frac{3}{8}$	$3\frac{5}{8}$	$17\frac{1}{2}$	$2\frac{1}{2}$	$3\frac{3}{4}$	$16\frac{2}{3}$
$2\frac{5}{32}$	$1\frac{7}{32}$	$13\frac{9}{16}$	$3\frac{1}{3}$	$6\frac{2}{3}$	$17\frac{1}{2}$
$1\frac{7}{16}$	$2\frac{3}{16}$	$21\frac{1}{8}$	$6\frac{1}{4}$	$2\frac{7}{12}$	$6\frac{1}{4}$
$3\frac{1}{4}$	$4\frac{3}{4}$	$24\frac{11}{32}$	$3\frac{5}{6}$	$1\frac{1}{2}$	$13\frac{5}{6}$

3.

$2\frac{2}{3}$	$2\frac{1}{2}$	$16\frac{1}{4}$	$1\frac{1}{4}$	$8\frac{1}{3}$	$23\frac{3}{7}$
$2\frac{4}{5}$	$3\frac{1}{3}$	$22\frac{2}{5}$	$2\frac{1}{3}$	$3\frac{3}{4}$	$1\frac{1}{3}$
$8\frac{7}{15}$	$2\frac{8}{15}$	$13\frac{1}{2}$	$3\frac{7}{8}$	$5\frac{1}{8}$	10
$4\frac{5}{6}$	$6\frac{3}{5}$	$21\frac{3}{10}$	$2\frac{5}{6}$	$3\frac{1}{6}$	$12\frac{1}{2}$

Find the sums. Check by measuring with a ruler. The sign ″ means inch(es).

4. $1\frac{3}{16}''+2\frac{1}{8}''+\frac{1}{2}''$ $\quad 2\frac{1}{2}''+\frac{7}{16}''+1\frac{3}{4}''$

5. $\frac{1}{4}''+2\frac{1}{2}''+1\frac{9}{16}''$ $\quad 1\frac{1}{4}''+\frac{3}{8}''+\frac{11}{16}''$

Extra Practice in Subtracting Fractions

Subtract the number in red from each number in the row with it. Leave each answer in simplest form.

1.	$\frac{7}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{7}{16}$	$\frac{5}{12}$	$\frac{5}{8}$	$\frac{9}{16}$	$-\frac{1}{4}$
2.	$\frac{5}{12}$	$\frac{7}{15}$	$\frac{5}{6}$	$\frac{4}{9}$	$\frac{7}{12}$	$\frac{2}{3}$	$\frac{11}{15}$	$-\frac{1}{3}$
3.	$\frac{2}{3}$	$\frac{5}{6}$	$\frac{4}{9}$	$\frac{1}{3}$	$\frac{5}{12}$	$\frac{8}{15}$	$\frac{7}{12}$	$-\frac{1}{6}$
4.	$\frac{5}{16}$	$\frac{1}{4}$	$\frac{7}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{3}{8}$	$\frac{11}{16}$	$-\frac{3}{16}$
5.	$\frac{3}{8}$	$\frac{3}{4}$	$\frac{7}{16}$	$\frac{1}{4}$	$\frac{13}{16}$	$\frac{7}{8}$	$\frac{1}{2}$	$-\frac{1}{8}$
6.	$\frac{1}{3}$	$\frac{3}{5}$	$\frac{4}{7}$	$\frac{3}{8}$	$\frac{5}{9}$	$\frac{7}{15}$	$\frac{2}{3}$	$-\frac{1}{4}$
7.	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{2}{5}$	$\frac{5}{8}$	$\frac{7}{9}$	$\frac{11}{15}$	$\frac{7}{8}$	$-\frac{1}{3}$
8.	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{7}{8}$	$\frac{5}{6}$	$\frac{8}{9}$	$\frac{13}{15}$	$\frac{11}{16}$	$-\frac{2}{5}$
9.	$\frac{5}{4}$	$\frac{7}{8}$	$\frac{11}{8}$	2	$\frac{3}{2}$	$\frac{3}{4}$	$\frac{11}{16}$	$-\frac{5}{8}$
10.	1	$\frac{13}{6}$	$\frac{7}{8}$	$\frac{3}{2}$	$\frac{10}{3}$	3	$\frac{13}{12}$	$-\frac{5}{6}$
11.	$1\frac{7}{8}$	$2\frac{1}{2}$	$1\frac{3}{4}$	$3\frac{7}{16}$	$2\frac{5}{12}$	$4\frac{5}{8}$	$6\frac{9}{16}$	$-1\frac{1}{4}$
12.	$3\frac{5}{12}$	$4\frac{7}{15}$	$6\frac{5}{6}$	$3\frac{4}{9}$	$5\frac{7}{12}$	$6\frac{2}{3}$	$5\frac{11}{15}$	$-2\frac{1}{3}$
13.	$6\frac{2}{3}$	$5\frac{5}{6}$	$3\frac{4}{9}$	$8\frac{1}{3}$	$7\frac{5}{12}$	$7\frac{8}{15}$	$8\frac{7}{12}$	$-3\frac{1}{6}$
14.	$7\frac{5}{16}$	$8\frac{1}{4}$	$6\frac{7}{8}$	$9\frac{1}{2}$	$8\frac{3}{4}$	$7\frac{3}{8}$	$5\frac{11}{16}$	$-5\frac{3}{16}$
15.	$9\frac{3}{8}$	$8\frac{3}{4}$	$7\frac{7}{16}$	$6\frac{1}{4}$	$5\frac{13}{16}$	$6\frac{7}{8}$	$9\frac{1}{2}$	$-5\frac{1}{8}$
16.	$6\frac{1}{4}$	$6\frac{1}{6}$	$3\frac{1}{3}$	$7\frac{1}{2}$	$8\frac{1}{6}$	$5\frac{2}{5}$	$9\frac{1}{8}$	$-2\frac{1}{2}$
17.	$2\frac{1}{2}$	$3\frac{1}{3}$	$6\frac{1}{4}$	$3\frac{3}{4}$	$5\frac{2}{5}$	$7\frac{1}{2}$	$4\frac{1}{6}$	$-1\frac{5}{8}$
18.	$4\frac{1}{2}$	$8\frac{1}{3}$	$5\frac{3}{8}$	$6\frac{1}{4}$	$4\frac{4}{7}$	$5\frac{5}{6}$	$9\frac{3}{8}$	$-3\frac{3}{4}$
19.	$6\frac{1}{4}$	$8\frac{2}{9}$	$7\frac{5}{6}$	$5\frac{1}{16}$	$5\frac{1}{2}$	$7\frac{2}{5}$	$8\frac{1}{3}$	$-4\frac{7}{8}$
20.	$7\frac{1}{2}$	$8\frac{1}{3}$	$6\frac{3}{4}$	$9\frac{4}{5}$	$7\frac{5}{8}$	$8\frac{5}{6}$	$9\frac{7}{8}$	$-6\frac{2}{3}$

Extra Practice in Multiplying Fractions

Multiply the number in red by each number in the row with it. Leave each answer in simplest form.

1.	48	16	20	28	32	76	$\times\frac{3}{4}$
2.	32	72	40	64	80	48	$\times 1\frac{5}{8}$
3.	33	43	16	32	53	77	$\times\frac{5}{6}$
4.	10	53	52	19	29	74	$\times 6\frac{2}{3}$
5.	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{7}{14}$	$\frac{5}{8}$	$\frac{3}{16}$	$\frac{3}{8}$	$\times 32$
6.	$\frac{2}{3}$	$\frac{5}{12}$	$\frac{1}{2}$	$\frac{7}{24}$	$\frac{1}{6}$	$\frac{1}{4}$	$\times 24$
7.	$\frac{1}{3}$	$\frac{2}{5}$	$\frac{1}{12}$	$\frac{7}{8}$	$\frac{5}{6}$	$\frac{4}{9}$	$\times 28$
8.	$2\frac{1}{2}$	$3\frac{5}{6}$	$6\frac{1}{4}$	$1\frac{2}{5}$	$1\frac{7}{8}$	$1\frac{3}{4}$	$\times 27$
9.	$\frac{1}{2}$	$\frac{3}{5}$	$\frac{1}{8}$	$\frac{3}{7}$	$\frac{7}{8}$	$\frac{3}{4}$	$\times\frac{3}{4}$
10.	$\frac{2}{3}$	$\frac{4}{5}$	$\frac{3}{4}$	$\frac{3}{8}$	$\frac{3}{10}$	$\frac{2}{7}$	$\times\frac{5}{6}$
11.	$\frac{3}{4}$	$\frac{3}{8}$	$\frac{1}{7}$	$\frac{5}{6}$	$\frac{1}{2}$	$\frac{2}{3}$	$\times 6\frac{1}{4}$
12.	$\frac{3}{5}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{5}{8}$	$\frac{6}{7}$	$\frac{9}{10}$	$\times 3\frac{1}{3}$
13.	$1\frac{1}{4}$	$2\frac{1}{2}$	$3\frac{2}{3}$	$6\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{2}{7}$	$\times\frac{3}{8}$
14.	$1\frac{3}{5}$	$1\frac{1}{2}$	$3\frac{1}{3}$	$3\frac{1}{7}$	$5\frac{1}{10}$	$3\frac{1}{5}$	$\times\frac{5}{6}$
15.	$3\frac{2}{5}$	$6\frac{1}{4}$	$7\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{2}{7}$	$2\frac{1}{9}$	$\times 2\frac{7}{8}$
16.	$2\frac{2}{5}$	$3\frac{1}{3}$	$1\frac{1}{15}$	$3\frac{1}{5}$	$4\frac{1}{6}$	$6\frac{2}{3}$	$\times 1\frac{7}{8}$

17. $\frac{222}{3\frac{1}{5}}$ $\frac{237\frac{1}{2}}{4}$ $\frac{416\frac{2}{3}}{6}$ $\frac{750}{6\frac{2}{3}}$ $\frac{224}{3\frac{1}{7}}$

18. $\frac{620\frac{3}{4}}{8}$ $\frac{263\frac{1}{3}}{21}$ $\frac{504\frac{5}{6}}{36}$ $\frac{924\frac{3}{8}}{32}$ $\frac{838\frac{3}{5}}{25}$

Extra Practice in Dividing Fractions

Divide each number in a row by the number in red at the end of the row. Leave each answer in simplest form.

1.	15	27	51	75	39	21	$\div\frac{2}{3}$
2.	12	15	21	24	57	36	$\div\frac{3}{4}$
3.	42	75	102	140	80	30	$\div 2\frac{2}{5}$
4.	30	45	120	210	135	75	$\div 1\frac{7}{8}$
5.	$\frac{6}{7}$	$\frac{3}{5}$	$\frac{15}{16}$	$\frac{9}{20}$	$\frac{21}{32}$	$\frac{12}{25}$	$\div 6$
6.	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{5}{6}$	$\frac{1}{12}$	$\frac{15}{16}$	$\frac{7}{15}$	$\div 2$
7.	$2\frac{1}{3}$	$1\frac{3}{4}$	$5\frac{2}{3}$	$4\frac{1}{4}$	$1\frac{1}{2}$	$8\frac{1}{4}$	$\div 5$
8.	$2\frac{4}{5}$	$1\frac{7}{8}$	$1\frac{3}{5}$	$2\frac{2}{3}$	$3\frac{1}{7}$	$4\frac{2}{3}$	$\div 6$
9.	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{5}{6}$	$\frac{7}{12}$	$\frac{11}{16}$	$\frac{15}{32}$	$\div\frac{3}{5}$
10.	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{5}{6}$	$\frac{7}{12}$	$\frac{11}{16}$	$\frac{15}{32}$	$\div\frac{5}{6}$
11.	$\frac{8}{15}$	$\frac{7}{12}$	$\frac{3}{8}$	$\frac{25}{32}$	$\frac{1}{6}$	$\frac{9}{16}$	$\div 1\frac{2}{3}$
12.	$\frac{14}{15}$	$\frac{21}{32}$	$\frac{7}{8}$	$\frac{7}{9}$	$\frac{35}{36}$	$\frac{7}{25}$	$\div 1\frac{3}{4}$
13.	$1\frac{7}{8}$	$3\frac{3}{4}$	$4\frac{1}{6}$	$7\frac{1}{2}$	$6\frac{1}{4}$	$12\frac{1}{2}$	$\div 1\frac{1}{2}$
14.	$8\frac{1}{3}$	$6\frac{2}{3}$	$2\frac{3}{8}$	$6\frac{7}{8}$	$9\frac{5}{6}$	$16\frac{2}{3}$	$\div 2\frac{1}{2}$
15.	$1\frac{7}{8}$	$3\frac{3}{4}$	$4\frac{5}{6}$	$7\frac{1}{2}$	$6\frac{3}{4}$	$12\frac{1}{2}$	$\div\frac{3}{4}$
16.	$8\frac{1}{3}$	$6\frac{2}{3}$	$2\frac{3}{8}$	$6\frac{7}{8}$	$9\frac{1}{6}$	$16\frac{2}{3}$	$\div\frac{2}{5}$

17.	$750 \div 2\frac{1}{2}$	$280 \div 3\frac{1}{3}$	$225 \div 7\frac{1}{2}$	$175 \div 1\frac{7}{8}$
18.	$682 \div 3\frac{1}{7}$	$150 \div 3\frac{3}{4}$	$400 \div 6\frac{1}{4}$	$360 \div 16\frac{2}{3}$
19.	$312\frac{1}{2} \div 2$	$186\frac{3}{4} \div 3$	$266\frac{2}{3} \div 4$	$313\frac{1}{5} \div 6$
20.	$715\frac{1}{2} \div 6$	$310\frac{2}{3} \div 8$	$287\frac{1}{4} \div 6$	$373\frac{1}{3} \div 9$

Extra Work with Decimals

1. Multiply each number in Row A by 10.

A. 32 4.6 .84 .016 7.52 .0056 200

2. Multiply each number in Row A by 100.

3. Multiply each number in Row A by 1000.

4. Divide each number in Row B by 10.

B. 232 15.6 4800 93.05 1.44 172.8 70,000

5. Divide each number in Row B by 100.

6. Divide each number in Row B by 1000.

Copy the examples. Write the decimal point correctly in each product.

7. $3.7 \times 8.44 = 3\,1\,2\,2\,8$ $\quad .28 \times .84 = 2\,3\,5\,2$

8. $9.24 \times 6.3 = 5\,8\,2\,1\,2$ $\quad 18.2 \times 9.3 = 1\,6\,9\,2\,6$

9. $81.6 \times 2.4 = 1\,9\,5\,8\,4$ $\quad 387 \times 3.5 = 1\,3\,5\,4\,5$

Find the products.

10.

28.9	5.67	65.93	5.638	7.816
.4	.62	3.9	6.8	434

11.

1483	13.5	17.28	3.006	567.8
6.7	439	1.44	9.9	33.3

Copy the examples. Write the decimal point correctly in each quotient.

12. $.35\overline{)1\,3\,5.4\,5}$ $\quad 3\,8\,7$ $\qquad 1.82\overline{)1\,6.9\,2\,6}$ $\quad 9\,3$

13. $.028\overline{)2.3\,5\,2}$ $\quad 8\,4$ $\qquad 8.16\overline{)1.9\,5\,8\,4}$ $\quad 2\,4$

14. $92.4\overline{)5.8\,2\,1\,2}$ $\quad 6\,3$ $\qquad .844\overline{)312.2\,8}$ $\quad 3\,7$

Find the quotients.

15. $16.7\overline{)75.15}$ $\quad .56\overline{)44.24}$ $\quad .876\overline{)109.5}$

16. $10.3\overline{)375.1}$ $\quad .49\overline{)7.889}$ $\quad 67.4\overline{)131.430}$

17. $.364\overline{)376.74}$ $\quad 90.2\overline{)2.1648}$ $\quad .0286\overline{)18.018}$

Copy neatly in straight columns and add.

18. 1876.5 9360.1 3419.6 562.7 81.9

19. 4.37 76.64 125.18 349.01 725.54

20. 1.625 .875 12.650 32.100 51.287

21. 6.1875 .1875 .0675 9.1250 .0056

22. 136.14 8.125 .1776 625.3 87.62

Subtract.

23.

8.1	9.7	7.0	6.24	7.05	4.01
4.3	6.0	2.4	1.42	3.96	2.05

24.

7.5	8.3	.27	.433	.650	.984
6.9	.4	.09	.359	.464	.008

25. $6.25 - 3.75$ $\quad 18.93 - 9.75$ $\quad 6.046 - 3.954$

26. $.125 - .003$ $\quad .9301 - .125$ $\quad 9.754 - 6.93$

27. $.47 - .1893$ $\quad 8.38 - 4.875$ $\quad 167.3 - 54.15$

28. Use both (1) common fractions and mixed numbers, and (2) decimals to find the distances around rectangles whose lengths and widths are given.

Length	$\frac{3}{8}''$	$\frac{3}{4}''$	$\frac{7}{8}''$	$\frac{1}{2}''$	$\frac{11}{16}''$	$\frac{5}{8}''$
Width	$\frac{1}{4}''$	$\frac{1}{2}''$	$\frac{5}{16}''$	$\frac{3}{16}''$	$\frac{3}{8}''$	$\frac{1}{4}''$

A Page of Mixed Practice

Add.

1.

8	42	986	750
7	8	47	7
4	73	143	917
0	86	8	84
9	19	79	92
3	70	840	773
8	5	200	93

2.

$\frac{1}{2}$	$3\frac{1}{3}$	8.5	5.92
$\frac{3}{8}$	$3\frac{3}{4}$	.6	.4
$\frac{2}{3}$	$7\frac{1}{2}$	.9	3.72
$\frac{5}{6}$	$6\frac{1}{4}$	1.3	5.9

Subtract.

3.

4862	7963
3184	1505

4.

9020	5000
3916	2004

5.

$\frac{7}{8}$	$8\frac{1}{3}$	$17\frac{1}{2}$
$\frac{5}{16}$	$4\frac{1}{2}$	$6\frac{2}{3}$

6.

75.35	9.4
1.67	3.125

Multiply.

7.

57	704	9142
28	37	58

8. $8 \times 3\frac{3}{4}$

9. $8\frac{1}{3} \times \frac{4}{5}$

10. $866\frac{2}{3} \times 6$

11. 68.137×8.4

Divide.

12. $89\overline{)12493}$ $92\overline{)63572}$

13. $17\overline{)44880}$ $29\overline{)89204}$

14. $\frac{5}{8} \div 6\frac{1}{4}$ $4 \div \frac{2}{3}$

15. $17\frac{1}{2} \div 5$ $25 \div 3\frac{3}{4}$

16. $1.728 \div .8$ $.8 \div .016$

17. $.216 \div .36$ $10.24 \div 1.6$

Copy the table. Fill in blanks.

	18.	19.	20.	21.	22.	23.	24.
Fraction	$\frac{5}{16}$	$\frac{3}{8}$		$\frac{7}{16}$		$\frac{5}{32}$	
Decimal	$.31\frac{1}{4}$		$.87\frac{1}{2}$		$.56\frac{1}{4}$		$.03\frac{1}{8}$

INDEX NOT REQUIRED

(THE END)